United States Department of Agriculture

Natural Resources Conservation Service

In cooperation with Kansas Agricultural Experiment Station

Soil Survey of Geary County, Kansas

How To Use This Soil Survey

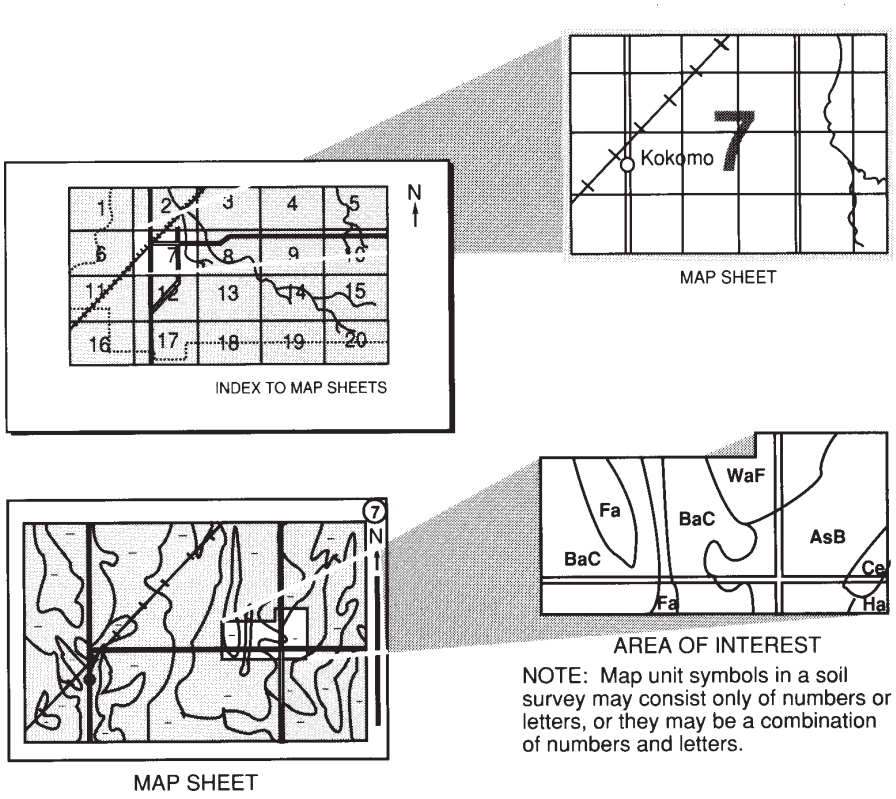
Detailed Soil Maps

The detailed soil maps can be useful in planning the use and management of small areas.

To find information about your area of interest, locate that area on the **Index to Map Sheets**. Note the number of the map sheet and turn to that sheet.

Locate your area of interest on the map sheet. Note that the map unit symbols are in that area. Turn to the **Contents**, which lists the map units by symbol and name and shows the page where each map unit is described.

The **Contents** shows which table has data on a specific land use for each detailed soil map unit. Also see the **Contents** for sections of this publication that may address your specific needs.



This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (formerly the Soil Conservation Service) has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in the period 1987 to 1991. Soil names and descriptions were approved in 1991. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1991. This survey was made cooperatively by the Natural Resources Conservation Service and the Kansas Agricultural Experiment Station. The survey is part of the technical assistance furnished to the Geary County Conservation District.

Cover: An area of Benfield and Florence soils on the steep, rocky slopes in the background. An area of the less sloping Tully soils is in the foreground.

Additional information about the Nation's natural resources is available online from the Natural Resources Conservation Service at http://www.nrcs.usda.gov.

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Issued 2005

Foreword

This soil survey contains information that affects land use planning in this survey area. It contains predictions of soil behavior for selected land uses. The survey also highlights soil limitations, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. The information in this report is intended to identify soil properties that are used in making various land use or land treatment decisions. Statements made in this report are intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described, and nformation on specific uses is given. Help in using this publication and additional information are available at the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

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Soil Survey of
Geary County, Kansas

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United States Department of Agriculture, Natural Resources Conservation Service, in cooperation with
Kansas Agricultural Experiment Station

General Nature of the County

GEARY COUNTY is in the east-central part of Kansas (fig. 1). It has a total area of 258,611 acres, or 404 square miles.

Most of the county is in the Bluestem Hills Major Land Resource Area (Austin, 1965). The northwest corner of the county is in the Central Loess Plains Major Land Resource Area. The soils in the Bluestem Hills are dissected by entrenched drainageways. They are shallow to deep, are gently sloping to steep, and have a clayey or loamy subsoil. The soils of the Central Loess Plains are generally deep, are nearly level to moderately sloping, and have a clayey or silty subsoil.

The county is drained by the Kansas River which is formed by the junction of the Smoky Hill and Republican Rivers at Junction City. The southern part of the county is drained by many deeply entrenched small streams that flow in a northwestern direction and empty into the Smoky Hill or Kansas Rivers.

About 44 percent of the county is range, 35 percent is cropland, and the rest is woodland, urban, industrial land, or water areas (USDA, 1982).

This survey updates the soil survey of Geary County, Kansas, published in 1960 (Dunmire and Bidwell, 1960), and the survey of Riley County, Kansas, and part of Geary County, Kansas, published in 1975 (Jantz and others, 1975). It provides additional information and improved soil interpretations.

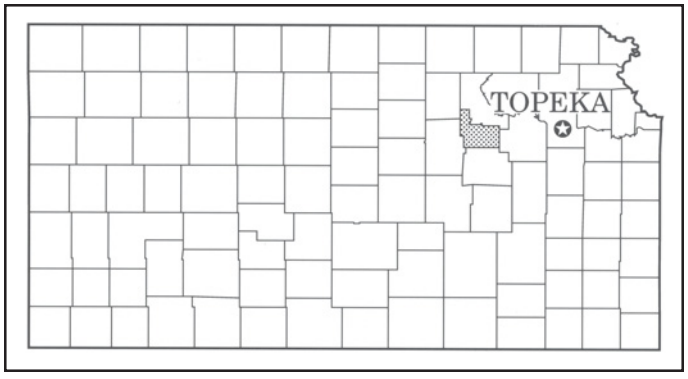

Figure 1.—Location of Geary County in Kansas.

Climate

Table 1 gives data on temperature and precipitation for the survey area as recorded at Milford, Kansas, in the period 1971 to 1990. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter, the average temperature is 29 degrees F and the average daily minimum temperature is 18 degrees. The lowest temperature on record, which occurred at Milford on February 1, 1979, is -18 degrees. In summer, the average temperature is 76 degrees and the average daily maximum temperature is 88 degrees. The highest recorded temperature, which occurred at Milford on July 15, 1980, is 110 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is about 32 inches. Of this total, 23 inches, or 70 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 18 inches. The heaviest 1-day rainfall during the period of record was 4.78 inches at Milford on June 18, 1977. Thunderstorms occur on about 57 days each year.

The average seasonal snowfall is about 16 inches. The greatest snow depth at any one time during the period of record was 15 inches. On the average, 27 days of the year have at least 1 inch of snow on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 65 percent of the time possible in summer and 55 percent in winter. The prevailing wind is from the south. Average windspeed is highest, 12 miles per hour, in the spring.

How This Survey Was Made

This survey was made to provide information about the soils and miscellaneous areas in the survey area. The information includes a description of the soils and miscellaneous areas and their location and a discussion of their suitability, limitations, and management for specified uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

The soils and miscellaneous areas in the survey area are in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept or model of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a

limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Detailed Soil Map Units

The map units delineated on the detailed soil maps in this survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this section, along with the maps, can be used to determine the suitability and potential of a unit for specific uses. They also can be used to plan the management needed for those uses.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. The contrasting components are mentioned in the map unit descriptions. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly

indicates a feature that affects use or management. For example, Geary silt loam, 3 to 7 percent slopes, is a phase of the Geary series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes. A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Benfield-Florence complex, 5 to 30 percent slopes, is an example.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. The map unit Gravel pits and quarries is an example.

In the descriptions, "LEP" means linear extensibility percent.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils or miscellaneous areas.

2177—McCook silt loam, occasionally flooded

This very deep, nearly level, well drained soil is on flood plains along major rivers. Slopes are 0 to 1 percent. Individual areas are irregular in shape and range from 20 to 300 acres in size.

Map Unit Composition

McCook: 86 percent
Minor components: 14 percent

Component Descriptions

McCook

Landform: Flood plains in river valleys
Parent material: Weakly stratified calcareous coarse-silty alluvium
Slope: 0 to 1 percent
Drainage class: Well drained
Slowest permeability: Moderate (about 0.60 inch per hour)
Available water capacity: High (about 11.8 inches)
Shrink-swell potential: Low (about 2.1 LEP)
Flooding frequency: Occasional
Ponding hazard: None
Depth to seasonal zone of saturation: More than 6 feet
Surface runoff class: Low
Ecological site: Loamy Lowland (pe25-34)
Land capability (nonirrigated): 2w

Typical profile:
A—0 to 16 inches; silt loam
AC—16 to 25 inches; silt loam
C—25 to 60 inches; very fine sandy loam

Component note: Included with this soil in mapping are small areas of Eudora, Smokyhill, and Solomon soils. Eudora soils do not have carbonates within 20 inches of the surface. The moderately well drained Smokyhill soils contain more clay than the McCook soils and are in depressions. The poorly drained Solomon soils contain more clay than the McCook soils and are in abandoned channels and backwater areas. Also included are short, steep escarpments to adjoining higher or lower bottom land. Included soils make up about 20 percent of the map unit.

Minor components

Eudora
Extent: About 10 percent of the unit
Landform: Flood plains in river valleys
Slope: 0 to 1 percent
Drainage class: Well drained
Ecological site: Loamy Lowland (pe30-36)

Smokyhill
Extent: About 3 percent of the unit
Landform: Depressions on flood plains in river valleys
Slope: 0 to 1 percent
Drainage class: Moderately well drained
Ecological site: Clay Lowland (pe30-36)

Solomon
Extent: About 1 percent of the unit
Landform: Ephemeral oxbow lakes on flood plains in river valleys
Slope: 0 to 1 percent
Drainage class: Poorly drained
Ecological site: Clay Lowland (pe30-36)

General Considerations

Nearly all of the acreage is used for cultivated crops. It is well suited to wheat, grain sorghum, alfalfa, and soybeans.

Flooding and soil blowing are hazards if cultivated crops are grown. Flooding delays planting and harvesting and damages crops in some years, but in other years the extra moisture may increase crop yields. Overcoming the hazard of flooding is difficult without major flood-control measures. Applying a system of conservation tillage that leaves all or part of the crop residue on the surface improves fertility and tilth and increases the rate of water infiltration.

Grain sorghum, soybeans, and corn are the main irrigated crops. Using water efficiently and maintaining soil fertility are management concerns. Controlling the rate of water application helps to conserve irrigation water and lowers the cost of operation.

This soil is generally unsuited to dwellings, septic tank absorption fields, and sewage lagoons because of the flooding. Dikes, levees, and other structures lessen this hazard.

2181—McCook-Smokyhill silt loams, occasionally flooded

These very deep, nearly level soils are on flood plains along major rivers. The well drained McCook soils are on the higher parts of the landscape, and the moderately well drained Smokyhill soils are usually in small depressions. Slopes are 0 to 1 percent. Individual areas are irregular in shape and range from 10 to 300 acres in size. The two soils occur as areas so intricately mixed or so small that mapping them separately is impractical.

Map Unit Composition

McCook: 68 percent
Smokyhill: 26 percent
Minor components: 6 percent

Component Descriptions

McCook

Landform: Flood plains in river valleys
Parent material: Weakly stratified calcareous coarse-silty alluvium
Slope: 0 to 1 percent
Drainage class: Well drained
Slowest permeability: Moderate (about 0.60 inch per hour)
Available water capacity: High (about 11.7 inches)
Shrink-swell potential: Low (about 2.1 LEP)
Flooding frequency: Occasional
Ponding hazard: None
Depth to seasonal zone of saturation: More than 6 feet
Surface runoff class: Low
Ecological site: Loamy Lowland (pe25-34)
Land capability (nonirrigated): 2w

Typical profile:
A—0 to 12 inches; silt loam
AC—12 to 23 inches; silt loam
C—23 to 60 inches; very fine sandy loam

Component note: Included with these soils in mapping are small areas of Sutphen soils. The Sutphen soils contain more clay throughout and are in positions on the landscape similar to those of the Smokyhill soil. Also included in mapping is a soil that contains more clay than McCook soils and has dark color at depths more than 20 inches.

Smokyhill

Landform: Depressions on flood plains in river valleys
Parent material: Clayey alluvium over silty alluvium
Slope: 0 to 1 percent
Drainage class: Moderately well drained
Slowest permeability: Slow (about 0.06 inch per hour)
Available water capacity: High (about 10.7 inches)
Shrink-swell potential: High (about 6.8 LEP)
Flooding frequency: Occasional
Ponding frequency: Rare
Depth to seasonal zone of saturation: More than 6 feet
Surface runoff class: Negligible
Ecological site: Clay Lowland (pe30-36)
Land capability (nonirrigated): 2w

Typical profile:
Ap—0 to 6 inches; silt loam
A—6 to 14 inches; silty clay loam
AC—14 to 30 inches; silty clay loam
2C—30 to 72 inches; silt loam

Minor components

Sutphen
Extent: About 5 percent of the unit
Landform: Flood plains in river valleys
Slope: 0 to 1 percent
Drainage class: Somewhat poorly drained
Ecological site: Clay Lowland (pe30-36)

Solomon
Extent: About 1 percent of the unit
Landform: Ephemeral oxbow lakes on flood plains in river valleys
Slope: 0 to 1 percent
Drainage class: Poorly drained
Ecological site: Clay Lowland (pe30-36)

General Considerations

Nearly all of the acreage is used for cultivated crops. These soils are well suited to corn, grain sorghum, soybeans, wheat, and alfalfa. If cultivated crops are grown, flooding and soil blowing are hazards on both soils. Surface compacting is a problem if the Smokyhill soils are tilled when they are too wet. It can be minimized by timely tillage. Applying a system of conservation tillage that leaves all or part of the crop residue on the surface improves fertility and tilth and increases the rate of water infiltration.

The McCook and Smokyhill soils are generally unsuited to dwellings, septic tank absorption fields, and sewage lagoons because of the flooding. Dikes, levees, and other structures lessen this hazard.

2347—McCook silt loam, rarely flooded

This very deep, nearly level, well drained soil is on stream terraces along major rivers. Slopes are 0 to 1 percent. Individual areas are irregular in shape and range from 20 to 300 acres in size.

Map Unit Composition

McCook: 87 percent
Minor components: 13 percent

Component Descriptions

McCook

Landform: Stream terraces in river valleys
Parent material: Weakly stratified calcareous coarse-silty alluvium
Slope: 0 to 1 percent
Drainage class: Well drained
Slowest permeability: Moderate (about 0.60 inch per hour)
Available water capacity: High (about 11.8 inches)
Shrink-swell potential: Low (about 2.1 LEP)
Flooding frequency: Rare
Ponding hazard: None
Depth to seasonal zone of saturation: More than 6 feet
Surface runoff class: Low
Ecological site: Loamy Lowland (pe25-34)
Land capability (nonirrigated): 1

Typical profile:
A—0 to 16 inches; silt loam
AC—16 to 25 inches; silt loam
C—25 to 60 inches; very fine sandy loam

Component note: Included with this soil in mapping are small areas of Eudora and Smokyhill soils. The Eudora soils lack carbonates in the upper 20 inches and are lower on the flood plain. The moderately well drained Smokyhill soils contain more clay in the subsoil than the McCook soils and are in depressions.

Minor components

Eudora
Extent: About 10 percent of the unit
Landform: Flood plains in river valleys
Slope: 0 to 2 percent
Drainage class: Well drained
Ecological site: Loamy Lowland (pe30-36)

Smokyhill
Extent: About 3 percent of the unit
Landform: Depressions on flood plains in river valleys
Slope: 0 to 1 percent
Drainage class: Moderately well drained
Ecological site: Clay Lowland (pe30-36)

General Considerations

Nearly all of the acreage is used for cultivated crops. It is well suited to wheat, grain sorghum, alfalfa, and soybeans. The main management concern is maintenance of fertility and tilth. Applying a system of conservation tillage that leaves all or part of the crop residue on the surface improves fertility and tilth and increases the rate of water infiltration. Crop rotations help to control weeds, plant diseases, and insects.

Grain sorghum, soybeans, and corn are the main irrigated crops. Using water efficiently and maintaining soil fertility are management concerns. Controlling the rate of water application helps to conserve irrigation water and lowers the cost of operation.

This soil is poorly suited to dwellings and moderately well suited to septic tank absorption fields. The flooding is a hazard affecting both uses. Dikes, levees, and other structures can reduce the hazard of flooding. Onsite inspection and knowledge of the flooding history of the area are needed when building sites are selected. This soil is moderately well suited to sewage lagoons because of seepage. Sealing the lagoon helps to control seepage.

3400—Longford loam, 1 to 3 percent slopes

This very deep, gently sloping, well drained soil is on interfluves and upper side slopes. Individual areas are irregular in shape and range from 10 to 500 acres in size.

Map Unit Composition

Longford: 85 percent
Minor components: 15 percent

Component Descriptions

Longford

Landform: Hillslopes on uplands
Hillslope position: Summits, backslopes, and shoulders
Parent material: Loamy alluvium
Slope: 1 to 3 percent
Drainage class: Well drained
Slowest permeability: Slow (about 0.06 inch per hour)
Available water capacity: High (about 10.6 inches)
Shrink-swell potential: High (about 6.4 LEP)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal zone of saturation: More than 6 feet

Surface runoff class: High
Ecological site: Loamy Upland (pe25-34)
Land capability (nonirrigated): 2e

Typical profile:
A—0 to 11 inches; loam
BA—11 to 16 inches; clay loam
Bt—16 to 46 inches; clay loam
BC—46 to 54 inches; clay loam
C—54 to 60 inches; loam

Component note: Included with this soil in mapping are small areas of Crete, Ortello, and Wells soils. Crete soils have a browner subsoil than the Longford soils and are on ridgetops. Ortello soils contain more sand in the subsoil than the Longford soil and are on small mounds. Wells soils are less clayey and are on similar positions. Included soils make up about 15 percent of the map unit.

Minor components

Crete
Extent: About 5 percent of the unit
Landform: Hillslopes on uplands
Slope: 1 to 4 percent
Drainage class: Moderately well drained
Ecological site: Clay Upland (pe25-34)

Wells
Extent: About 5 percent of the unit
Landform: Hillslopes on uplands
Slope: 1 to 4 percent
Drainage class: Well drained
Ecological site: Loamy Upland (pe25-34)

Ortello
Extent: About 5 percent of the unit
Landform: Hillslopes on uplands
Slope: 1 to 4 percent
Drainage class: Well drained
Ecological site: Sandy (pe25-34)

General Considerations

Nearly all of the acreage is used for cultivated crops. This soil is well suited to wheat, grain sorghum, and alfalfa. Water erosion is a hazard if cultivated crops are grown. Terraces, grassed waterways, and contour farming help prevent excessive soil loss. A system of conservation tillage that leaves all or part of the crop residue on the surface improves fertility and tilth and increases the rate of water infiltration.

This soil is well suited to rangeland and tame grass pasture. The native vegetation is dominantly big bluestem, little bluestem, and switchgrass. Water erosion is a hazard if range is overgrazed. In some areas, gullies form along cattle trails. An adequate plant cover helps prevent excessive soil loss. Fencing and other means of controlling livestock traffic patterns can be used to prevent the formation of gullies and to give gullies time to revegetate. Proper stocking rates, a uniform distribution of grazing, and scheduled timely deferment of grazing during the growing season, help keep the range in good condition. Application of fertilizer and timely mowing of tame grass pasture increases plant vigor, quality, and quantity.

This soil is poorly suited to dwellings and septic tank absorption fields. It is moderately well suited to sewage lagoons. The shrink-swell potential is a limitation on

sites for dwellings. Properly designing and reinforcing foundations, installing sealed foundation drains, and backfilling with suitable coarse textured material help to prevent structural damage caused by shrinking and swelling.

The slow permeability restricts the absorption of effluent in septic tank absorption fields. It can be overcome by enlarging the field or by installing the lateral lines below the subsoil. The slope is a limitation on sites for sewage lagoons. If the less sloping areas are selected as sites for lagoons, less leveling and banking will be needed during construction.

3545—Hobbs silt loam, channeled

This very deep, nearly level, well drained soil is on narrow, low flood plains that are dissected by deeply entrenched drainageways. It is subject to frequent flooding for very brief periods. Individual areas range from 150 to 500 feet wide and from 500 feet to more than a mile in length. They range from 25 to 150 acres in size.

Map Unit Composition

Hobbs: 96 percent
Minor components: 4 percent

Component Descriptions

Hobbs

Landform: Flood plains on meander belts
Parent material: Stratified fine-silty alluvium
Slope: 0 to 2 percent
Drainage class: Well drained
Slowest permeability: Moderate (about 0.60 inch per hour)
Available water capacity: High (about 11.9 inches)
Shrink-swell potential: Moderate (about 3.3 LEP)
Flooding frequency: Frequent
Ponding hazard: None
Depth to seasonal zone of saturation: More than 6 feet
Surface runoff class: Low
Ecological site: Loamy Lowland (pe25-34)
Land capability (nonirrigated): 5w

Typical profile:
A—0 to 8 inches; silt loam
C1—8 to 24 inches; silt loam
C2—24 to 44 inches; silt loam
C3—44 to 60 inches; silt loam

Component note: Included with this soil in mapping are small areas of Crete, Geary, and Muir soils. Crete and Geary soils contain more clay in the subsoils and are on adjacent uplands. Muir soils are on adjacent high flood plains. Also included are soils that are calcareous to the surface, steep stream channels, and scour plains.

Minor components

Muir
Extent: About 2 percent of the unit
Landform: Flood plains on alluvial plains
Slope: 0 to 2 percent
Drainage class: Well drained

Ecological site: Loamy Terrace (pe25-34)

Crete
Extent: About 1 percent of the unit
Landform: Hillslopes on uplands
Slope: 3 to 8 percent
Drainage class: Moderately well drained
Ecological site: Clay Upland (pe25-34)

Geary
Extent: About 1 percent of the unit
Landform: Hillslopes on uplands
Slope: 7 to 15 percent
Drainage class: Well drained
Ecological site: Loamy Upland (pe25-34)

General Considerations

Most areas of this soil are used as range or wildlife habitat. This soil is generally unsuited to cultivated crops because of flooding. Operating machinery is difficult along the meandering stream channels.

This soil is better suited to range and tame grass pasture. Control of brush and the distribution of grazing are the main concerns of management. In some areas the range is overgrazed and in poor condition because it is near water and shade trees where livestock congregate. In these areas, the more productive grasses are replaced by less productive grasses and by weeds. Rotation grazing and restricting grazing to the winter months help to maintain the range in good condition. Controlled burning, proper use of chemicals, and selective cutting help to control woody plants.

The vegetation commonly growing on this soil provides habitat for many types of wildlife species, including quail, deer, rabbits, turkeys, and numerous songbirds. The wildlife population can be increased by establishing more fringe areas where woodland is adjacent to cropland.

This soil is well suited to timber and firewood production. Trees best suited to planting are black walnut, hackberry, green ash, and eastern cottonwood. Competition from less desirable trees and shrubs is the main concern for management.

This soil is generally unsuited to building site development because of the hazard of flooding. Overcoming this hazard is difficult without major flood-control measures.

3561—Hobbs silt loam, occasionally flooded

This very deep, nearly level, well drained soil is on narrow flood plains. Individual areas range from 150 to 500 feet wide and from 500 feet to more than a mile in length. They range from 25 to 150 acres in size.

Map Unit Composition

Hobbs: 96 percent
Minor components: 4 percent

Component Descriptions

Hobbs

Landform: Flood plains in valleys
Parent material: Stratified fine-silty alluvium
Slope: 0 to 2 percent
Drainage class: Well drained

Slowest permeability: Moderate (about 0.60 inch per hour)
Available water capacity: High (about 11.9 inches)
Shrink-swell potential: Moderate (about 3.3 LEP)
Flooding frequency: Occasional
Ponding hazard: None
Depth to seasonal zone of saturation: More than 6 feet
Surface runoff class: Low
Ecological site: Loamy Lowland (pe25-34)
Land capability (nonirrigated): 2w

Typical profile:
A—0 to 8 inches; silt loam
C1—8 to 24 inches; silt loam
C2—24 to 44 inches; silt loam
C3—44 to 60 inches; silt loam

Component note: Included with this soil in mapping are small areas of Crete, Geary, and Muir soils. Crete and Geary soils contain more clay in the subsoils and are on adjacent uplands. Muir soils are on adjacent high flood plains. Also included are soils that are calcareous to the surface, steep stream channels, and scour plains.

Minor components

Muir
Extent: About 2 percent of the unit
Landform: Flood plains on alluvial plains
Slope: 0 to 2 percent
Drainage class: Well drained
Ecological site: Loamy Terrace (pe25-34)

Geary
Extent: About 1 percent of the unit
Landform: Hillslopes on uplands
Slope: 3 to 8 percent
Drainage class: Well drained
Ecological site: Loamy Upland (pe25-34)

Crete
Extent: About 1 percent of the unit
Landform: Hillslopes on uplands
Slope: 3 to 8 percent
Drainage class: Moderately well drained
Ecological site: Clay Upland (pe25-34)

General Considerations

About half of the acreage is used for cultivated crops. The rest is range or wildlife habitat. This soil is well suited to wheat, grain sorghum, and alfalfa. Crop yields are reduced in some years because of flooding. The main management concern is maintenance of fertility and tilth. A system of conservation tillage that leaves all or part of the crop residue on the surface improves fertility and tilth and increases the rate of water infiltration.

Areas along streams channels and edge areas where cropland is adjacent to range or woodland provide habitat for many kinds of wildlife, including quail, deer, rabbits, turkeys, and numerous songbirds. The habitat can be improved by planting trees or shrubs or by leaving small areas of unharvested crops along the edge of the cropland.

This soil is well suited to timber and firewood production. Trees best suited to planting are black walnut, hackberry, green ash, and eastern cottonwood. Competition from less desirable trees and shrubs is the main concern for management.

This soil is generally unsuited to dwellings, septic tank absorption fields, and sewage lagoons because of the hazard of flooding. Dikes, levees, and other structures lessen this hazard.

3617—Solomon silty clay, occasionally flooded

This very deep, nearly level, poorly drained soil is in depressions and abandoned channels on flood plains. Slopes are 0 to 1 percent. Individual areas range from 150 to 800 feet wide and from 500 to more than 2,000 feet in length. They range from 5 to 175 acres in size.

Map Unit Composition

Solomon: 85 percent
Minor components: 15 percent

Component Descriptions

Solomon

Landform: Ephemeral oxbow lakes on flood plains in river valleys
Parent material: Clayey alluvium
Slope: 0 to 1 percent
Drainage class: Poorly drained
Slowest permeability: Very slow (about 0.0015 inch per hour)
Available water capacity: Moderate (about 6.5 inches)
Shrink-swell potential: Very high (about 10.4 LEP)
Flooding frequency: Occasional
Ponding frequency: Frequent
Depth to seasonal zone of saturation: More than 6 feet
Surface runoff class: Negligible
Ecological site: Clay Lowland (pe30-36)
Land capability (nonirrigated): 3w

Typical profile:
Ap—0 to 8 inches; silty clay
A—8 to 19 inches; silty clay
Bg1—19 to 36 inches; clay
Bg2—36 to 50 inches; clay
Bg3—50 to 60 inches; clay

Component note: Included with this soil in mapping are small areas of McCook and Sutphen soils. The well drained McCook soils contain less clay in the subsoil than the Solomon soil and are in positions higher on the landscape than the Solomon soil. The moderately well drained Sutphen soils have carbonates below 15 inches from the surface. Sutphen soils are in positions on the landscape that are similar to those of the Solomon soil. Also included are better drained short, steep escarpments to the adjoining higher flood plains. Included soils make up about 15 percent of the map unit.

Minor components

Sutphen
Extent: About 10 percent of the unit
Landform: Flood plains in river valleys

Slope: 0 to 1 percent
Drainage class: Somewhat poorly drained
Ecological site: Clay Lowland (pe30-36)

McCook
Extent: About 5 percent of the unit
Landform: Stream terraces in river valleys
Slope: 0 to 1 percent
Drainage class: Well drained
Ecological site: Loamy Lowland (pe25-34)

General Considerations

About half of the acreage is used for cultivated crops. The rest is used as wildlife habitat. This soil is moderately well suited to grain sorghum, soybeans, and wheat. Flooding is a hazard if cultivated crops are grown. Wetness is a limitation in spring and early summer. Crop yields are reduced in some years because of flooding and ponding. In years with above average rainfall, ponding and flooding delay planting and harvesting and cause some crop damage. Overcoming the flooding hazard is difficult without major flood-control measures. Surface compacting is a problem if this soil is tilled when it is too wet; however, it can be minimized with timely tillage. The clayey surface and subsoil resist the movement of air, water, and roots and slowly release water to growing plants. Applying a system of conservation tillage that leaves all or part of the crop residue on the surface improves fertility and tilth and increases the rate of water infiltration.

This soil is suitable for use as wildlife habitat. It provides habitat for many wildlife species, including waterfowl, deer, pheasants, and numerous songbirds. The wildlife population can be increased by planting small scattered patches of millet or grain sorghum.

This soil is generally unsuited to dwellings and septic tank absorption fields because of the hazard of flooding, wetness, and shrink-swell potential. Also, it is unsuited to sewage lagoons because of the hazard of flooding.

3633—Sutphen silty clay, occasionally flooded

This very deep, nearly level, moderately well drained soil is on flood plains along major rivers. Slopes are 0 to 1 percent. Individual areas are irregular in shape and range from 10 to 100 acres in size.

Map Unit Composition

Sutphen: 81 percent
Minor components: 19 percent

Component Descriptions

Sutphen

Landform: Flood plains in river valleys
Parent material: Clayey alluvium
Slope: 0 to 1 percent
Drainage class: Somewhat poorly drained
Slowest permeability: Very slow (about 0.0015 inch per hour)
Available water capacity: Moderate (about 7.9 inches)
Shrink-swell potential: Very high (about 9.7 LEP)
Flooding frequency: Occasional

Ponding frequency: Occasional
Depth to seasonal zone of saturation: More than 6 feet
Surface runoff class: High
Ecological site: Clay Lowland (pe30-36)
Land capability (nonirrigated): 3w

Typical profile:
Ap—0 to 6 inches; silty clay
A1—6 to 11 inches; silty clay
A2—11 to 21 inches; silty clay
AC—21 to 30 inches; silty clay
C1—30 to 40 inches; silty clay
C2—40 to 60 inches; silty clay

Component note: Included with this soil in mapping are small areas of McCook, Muir, and Solomon soils. The well drained McCook and Muir soils are silty throughout and are on slightly higher landscapes. The poorly drained Solomon soils are calcareous to the surface and are on positions on the landscape similar to those of the Sutphen soil.

Minor components

Muir
Extent: About 10 percent of the unit
Landform: Flood plains on alluvial plains
Slope: 0 to 2 percent
Drainage class: Well drained
Ecological site: Loamy Terrace (pe25-34)

McCook
Extent: About 8 percent of the unit
Landform: Stream terraces in river valleys
Slope: 0 to 1 percent
Drainage class: Well drained
Ecological site: Loamy Lowland (pe25-34)

Solomon
Extent: About 1 percent of the unit
Landform: Ephemeral oxbow lakes on flood plains in river valleys
Slope: 0 to 1 percent
Drainage class: Poorly drained
Ecological site: Clay Lowland (pe30-36)

General Considerations

Nearly all acreage is used for cultivated crops. This soil is moderately well suited to grain sorghum and wheat. Flooding is a hazard if cultivated crops are grown. Crop yields are reduced in some years because of flooding. In years of above average rainfall, wetness and flooding may delay planting and harvesting. Overcoming the flooding hazard is difficult without major flood-control measures. Surface compacting is a problem if this soil is tilled when it is too wet; however, it can be minimized by timely tillage. The clayey surface and subsoil resist movement of air, water, and roots and slowly release water to growing plants. Applying a system of conservation tillage that leaves all or part of the crop residue on the surface improves fertility and tilth and increases the rate of water infiltration.

This soil is generally unsuited to dwellings and septic tank absorption fields because of the hazard of flooding, wetness, and shrink-swell potential. Also, it is unsuited to sewage lagoons because of the hazard of flooding.

3775—Muir silt loam, rarely flooded

This very deep, nearly level, well drained soil is on terraces of major rivers and creeks. Slopes are 0 to 2 percent. Individual areas are irregular in shape and range from 20 to several hundred acres in size.

Map Unit Composition

Muir: 95 percent
Minor components: 5 percent

Component Descriptions

Muir

Landform: Stream terraces on alluvial plains
Parent material: Silty alluvium
Slope: 0 to 2 percent
Drainage class: Well drained
Slowest permeability: Moderate (about 0.60 inch per hour)
Available water capacity: Very high (about 12.3 inches)
Shrink-swell potential: Moderate (about 3.0 LEP)
Flooding frequency: Rare
Ponding hazard: None
Depth to seasonal zone of saturation: More than 6 feet
Surface runoff class: Low
Ecological site: Loamy Terrace (pe25-34)
Land capability (nonirrigated): 1

Typical profile:
Ap—0 to 4 inches; silt loam
A—4 to 16 inches; silt loam
Bw1—16 to 24 inches; silt loam
Bw2—24 to 44 inches; silt loam
C—44 to 60 inches; silt loam

Component note: Included with this soil in mapping are small areas of moderately well drained soils similar to Sutphen soils. Sutphen soils contain more clay throughout and are in depressions. Also included in some areas are short sloping escarpments to the adjoining lower flood plain. Included areas make up about 5 percent of the map unit.

Minor components

Sutphen
Extent: About 5 percent of the unit
Landform: Flood plains in river valleys
Slope: 0 to 1 percent
Drainage class: Somewhat poorly drained
Ecological site: Clay Lowland (pe30-36)

General Considerations

Nearly all of the acreage is cultivated. This soil is well suited to wheat, grain sorghum, soybeans, and alfalfa. The main management concern is maintenance of fertility and tilth. Applying a system of conservation tillage that leaves all or part of the crop residue on the surface improves fertility and tilth and increases the rate of water infiltration.

Grain sorghum, soybeans, and corn are the main irrigated crops. Using water efficiently and maintaining soil fertility are management concerns. Controlling the rate of water application helps to conserve irrigation water and lowers the cost of operation.

This soil is poorly suited to dwellings and moderately well suited to septic tank absorption fields. The flooding is a hazard affecting both uses. Dikes, levees, and other structures can reduce the hazard of flooding. Onsite inspection and knowledge of the flooding history of the area are needed when building sites are selected. This soil is moderately well suited to sewage lagoons because of seepage. Sealing the lagoon helps to control seepage.

3827—Crete silty clay loam, 0 to 1 percent slopes

This very deep, nearly level, moderately well drained soil is on ridgetops. Individual areas are irregular in shape and range from 20 to 80 acres in size.

Map Unit Composition

Crete: 95 percent
Minor components: 5 percent

Component Descriptions

Crete

Landform: Ridges on uplands
Hillslope position: Summits and shoulders
Parent material: Loess
Slope: 0 to 1 percent
Drainage class: Moderately well drained
Slowest permeability: Slow (about 0.06 inch per hour)
Available water capacity: High (about 10.3 inches)
Shrink-swell potential: Very high (about 9.5 LEP)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal zone of saturation: More than 6 feet
Surface runoff class: Medium
Ecological site: Clay Upland (pe25-34)
Land capability (nonirrigated): 2s

Typical profile:
Ap—0 to 6 inches; silty clay loam
BA—6 to 14 inches; silty clay loam
Bt—14 to 30 inches; silty clay
Btk—30 to 42 inches; silty clay loam
BC—42 to 60 inches; silty clay loam

Minor components

Holder
Extent: About 5 percent of the unit
Landform: Hillslopes on uplands
Slope: 1 to 3 percent
Drainage class: Well drained
Ecological site: Loamy Upland (pe25-34)

General Considerations

Nearly all of the acreage is used for cultivated crops. The rest is used for rangeland and tame grass pasture. This soil is well suited to wheat, grain sorghum, soybeans, and alfalfa. The clayey subsoil, however, restricts the movement of water and air and root development and slowly releases water to plants. A system of conservation tillage

that leaves all or part of the crop residue on the surface improves fertility and tilth and increases the rate of water infiltration.

This soil is poorly suited to dwellings and septic tank absorption fields. It is moderately well suited to sewage lagoons. The shrink-swell potential is a limitation on sites for dwellings. Properly designing and reinforcing foundations, installing sealed foundation drains, and backfilling with suitable coarse textured material help to prevent structural damage caused by shrinking and swelling. The slow permeability restricts the absorption of effluent in the septic tank absorption fields. It can be overcome by enlarging the field or by installing the lateral lines below the subsoil. Seepage is a limitation on sites for sewage lagoons. It can be controlled by sealing the lagoon.

3828—Crete silty clay loam, 1 to 3 percent slopes

This very deep, gently sloping, moderately well drained soil is on ridgetops and side slopes. Individual areas are irregular in shape and range from 20 to 1,000 acres in size.

Map Unit Composition

Crete: 94 percent
Minor components: 6 percent

Component Descriptions

Crete

Landform: Hillslopes on uplands
Hillslope position: Shoulders and backslopes
Parent material: Loess
Slope: 1 to 3 percent
Drainage class: Moderately well drained
Slowest permeability: Slow (about 0.06 inch per hour)
Available water capacity: High (about 10.1 inches)
Shrink-swell potential: Very high (about 9.5 LEP)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal zone of saturation: More than 6 feet
Surface runoff class: High
Ecological site: Clay Upland (pe25-34)
Land capability (nonirrigated): 2e

Typical profile:
Ap—0 to 6 inches; silty clay loam
BA—6 to 11 inches; silty clay loam
Bt—11 to 27 inches; silty clay
Btk—27 to 40 inches; silty clay loam
BC—40 to 60 inches; silty clay loam

Component note: Included with this soil in mapping are small areas of Holder and Clime soils. The Holder soils are less clayey and are on similar positions. The moderately deep, calcareous Clime soils are on side slopes below the Crete soil.

Minor components

Holder
Extent: About 4 percent of the unit
Landform: Hillslopes on uplands
Slope: 1 to 3 percent
Drainage class: Well drained

Ecological site: Loamy Upland (pe25-34)

Clime
Extent: About 2 percent of the unit
Landform: Hillslopes on uplands
Slope: 1 to 3 percent
Depth to restrictive feature: 20 to 40 inches to bedrock (paralithic)
Drainage class: Well drained
Ecological site: Limy Upland (pe30-36)

General Considerations

Nearly all of the acreage is used for cultivated crops. The rest is used for rangeland and tame grass pasture. This soil is well suited to wheat, grain sorghum, soybeans, and alfalfa. Water erosion is a hazard if cultivated crops are grown. Terraces, grassed waterways, and contour farming help prevent excessive soil loss (fig. 2). A system of conservation tillage that leaves all or part of the crop residue on the surface improves fertility and tilth and increases the rate of water infiltration.

This soil is well suited to rangeland and tame grass pasture. The native vegetation is dominantly big bluestem, little bluestem, and switchgrass. Overgrazing reduces the extent of the plant cover and causes deterioration of the plant community. Under these conditions the more desirable grasses are replaced by less desirable grasses and by weeds. Proper stocking rates, rotation grazing, and timely deferment of grazing helps keep the grass in good condition. Invasion of woody plants has occurred in some places. Timely burning and proper use of chemicals help to control these plants. Application of fertilizer and timely mowing of tame grass pasture increase plant vigor, quality, and quantity.

This soil is poorly suited to dwellings and septic tank absorption fields. It is moderately well suited to sewage lagoons. The shrink-swell potential is a limitation on sites for dwellings. Properly designing and reinforcing foundations, installing sealed foundation drains, and backfilling with suitable coarse textured material help to prevent structural damage caused by shrinking and swelling. The slow permeability restricts the absorption of effluent in septic tank absorption fields. It can be overcome by enlarging

Figure 2.—Contour farming in an area of Crete silty clay loam, 1 to 3 percent slopes.

the field or by installing the lateral lines below the subsoil. Seepage is a limitation on sites for sewage lagoons. It can be controlled by sealing the lagoon.

3830—Crete silty clay loam, 3 to 7 percent slopes

This very deep, moderately sloping, moderately well drained soil is on side slopes. Individual areas are irregular in shape and range from 5 to 1,500 acres in size.

Map Unit Composition

Crete: 94 percent
Minor components: 6 percent

Component Descriptions

Crete

Landform: Hillslopes on uplands
Hillslope position: Shoulders and backslopes
Parent material: Loess
Slope: 3 to 7 percent
Drainage class: Moderately well drained
Slowest permeability: Slow (about 0.06 inch per hour)
Available water capacity: High (about 9.8 inches)
Shrink-swell potential: Very high (about 9.5 LEP)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal zone of saturation: More than 6 feet
Surface runoff class: Very high
Ecological site: Clay Upland (pe25-34)
Land capability (nonirrigated): 3e

Typical profile:
Ap—0 to 6 inches; silty clay loam
Bt—6 to 16 inches; silty clay
Btk—16 to 29 inches; silty clay loam
BC—29 to 46 inches; silty clay loam
C—46 to 60 inches; silt loam

Component note: Included with this soil in mapping are small areas of Holder and Clime soils. The Holder soils are well drained and less clayey and are on similar positions. The moderately deep, calcareous Clime soils are on side slopes below the Crete soil.

Minor components

Holder
Extent: About 4 percent of the unit
Landform: Hillslopes on uplands
Slope: 3 to 7 percent
Drainage class: Well drained
Ecological site: Loamy Upland (pe25-34)

Clime
Extent: About 2 percent of the unit
Landform: Hillslopes on uplands
Slope: 3 to 7 percent
Depth to restrictive feature: 20 to 40 inches to bedrock (paralithic)
Drainage class: Well drained
Ecological site: Limy Upland (pe30-36)

General Considerations

Nearly all of the acreage is used for cultivated crops. The rest is used for rangeland and tame grass pasture. This soil is well suited to wheat, grain sorghum, soybeans, and alfalfa. Water erosion is a hazard if cultivated crops are grown. Terraces, grassed waterways, and contour farming help prevent excessive soil loss. A system of conservation tillage that leaves all or part of the crop residue on the surface improves fertility and tilth and increases the rate of water infiltration.

This soil is well suited to rangeland and tame grass pasture. The native vegetation is dominantly big bluestem, little bluestem, and switchgrass. Overgrazing reduces the extent of the plant cover and causes deterioration of the plant community. Under these conditions the more desirable grasses are replaced by less desirable grasses and by weeds. Proper stocking rates, timely deferment of grazing, and a uniform distribution of grazing help keep the range in good condition. Invasion of woody plants has occurred in some places. Timely burning and proper use of chemicals help to control these plants. Application of fertilizer and timely mowing of tame grass pasture increase plant vigor, quality, and quantity.

This soil is poorly suited to dwellings and septic tank absorption fields. It is moderately well suited to sewage lagoons. The shrink-swell potential is a limitation on sites for dwellings. Properly designing and reinforcing foundations, installing sealed foundation drains, and backfilling with suitable coarse textured material help to prevent structural damage caused by shrinking and swelling. The slow permeability restricts the absorption of effluent in septic tank absorption fields. It can be overcome by enlarging the field or by installing the lateral lines below the subsoil. Seepage and the slope are limitations on sites for sewage lagoons. Seepage can be controlled by sealing the lagoon. If the less sloping areas are selected as sites for lagoons, less leveling and banking will be needed during construction.

3844—Geary silt loam, 3 to 7 percent slopes

This very deep, moderately sloping, well drained soil is on side slopes in the uplands. Individual areas are irregular in shape and range from 5 to 400 acres in size.

Map Unit Composition

Geary: 89 percent
Minor components: 11 percent

Component Descriptions

Geary

Landform: Hillslopes on uplands
Hillslope position: Footslopes and backslopes
Parent material: Silty loess
Slope: 3 to 7 percent
Drainage class: Well drained
Slowest permeability: Moderate (about 0.60 inch per hour)
Available water capacity: High (about 11.3 inches)
Shrink-swell potential: Moderate (about 5.6 LEP)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal zone of saturation: More than 6 feet
Surface runoff class: Medium
Ecological site: Loamy Upland (pe25-34)

Land capability (nonirrigated): 3e

Typical profile:
A1—0 to 8 inches; silt loam
A2—8 to 18 inches; silt loam
Bt1—18 to 25 inches; silty clay loam
Bt2—25 to 48 inches; silty clay loam
Bt3—48 to 60 inches; silty clay loam

Component note: Included with this soil in mapping are small areas of Clime, Crete, and Sogn soils. The moderately deep, calcareous Clime soils are on side slopes below the Geary soil. The moderately well drained Crete soils contain more clay in the subsoil than the Geary soil. The very shallow Sogn soils are on side slopes below the Geary soil.

Minor components

Crete
Extent: About 8 percent of the unit
Landform: Hillslopes on uplands
Slope: 3 to 7 percent
Drainage class: Moderately well drained
Ecological site: Clay Upland (pe25-34)

Clime
Extent: About 2 percent of the unit
Landform: Hillslopes on uplands
Slope: 3 to 7 percent
Depth to restrictive feature: 20 to 40 inches to bedrock (paralithic)
Drainage class: Well drained
Ecological site: Limy Upland (pe30-36)

Sogn
Extent: About 1 percent of the unit
Landform: Hillslopes on uplands
Slope: 6 to 12 percent
Depth to restrictive feature: 4 to 20 inches to bedrock (lithic)
Drainage class: Somewhat excessively drained
Ecological site: Shallow Limy (pe30-36)

General Considerations

Nearly all of the acreage is used for cultivated crops. This soil is well suited to wheat, grain sorghum, soybeans, and alfalfa. Water erosion is a hazard if cultivated crops are grown. Terraces, grassed waterways, and contour farming help prevent excessive soil loss. A system of conservation tillage that leaves all or part of the crop residue on the surface improves fertility and tilth and increases the rate of water infiltration.

This soil is moderately well suited to dwellings. The shrink-swell potential is a limitation on sites for dwellings. Properly designing and reinforcing foundations, installing sealed foundation drains, and backfilling with suitable coarse textured material help to prevent structural damage caused by shrinking and swelling.

This soil is moderately well suited to septic tank absorption fields and sewage lagoons. The moderate permeability restricts the absorption of effluent in septic tank absorption fields. It can be overcome by enlarging the field. Seepage and the slope are limitations on sites for sewage lagoons. Seepage can be controlled by sealing the lagoon. If the less sloping areas are selected as sites for lagoons, less leveling and banking will be needed during construction.

3845—Geary silt loam, 7 to 15 percent slopes

This very deep, strongly sloping, well drained soil is on side slopes along creeks and river valleys. Individual areas are irregular in shape and range from 50 to 500 acres in size.

Map Unit Composition

Geary: 94 percent
Minor components: 6 percent

Component Descriptions

Geary

Landform: Hillslopes on uplands
Hillslope position: Backslopes
Parent material: Silty loess
Slope: 7 to 15 percent
Drainage class: Well drained
Slowest permeability: Moderate (about 0.60 inch per hour)
Available water capacity: High (about 11.0 inches)
Shrink-swell potential: Moderate (about 5.6 LEP)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal zone of saturation: More than 6 feet
Surface runoff class: Medium
Ecological site: Loamy Upland (pe25-34)
Land capability (nonirrigated): 6e

Typical profile:
A1—0 to 6 inches; silt loam
A2—6 to 10 inches; silt loam
Bt1—10 to 16 inches; silty clay loam
Bt2—16 to 38 inches; silty clay loam
Bt3—38 to 60 inches; silty clay loam

Component note: Included with this soil in mapping are small areas of the moderately deep Clime soils and small areas of shallow Sogn soils. These included soils are on the steeper slopes and breaks. Also included are narrow, deep gullies. The gullies are generally less than 75 feet wide and range from 8 to 15 feet deep. The sides are nearly vertical breaks and the bottom is silty material that has been deposited by water or by gravity flow from upslope.

Minor components

Clime
Extent: About 5 percent of the unit
Landform: Hillslopes on uplands
Slope: 7 to 15 percent
Depth to restrictive feature: 20 to 40 inches to bedrock (paralithic)
Drainage class: Well drained
Ecological site: Limy Upland (pe30-36)

Sogn
Extent: About 1 percent of the unit
Landform: Hillslopes on uplands
Slope: 7 to 15 percent

Depth to restrictive feature: 4 to 20 inches to bedrock (lithic)
Drainage class: Somewhat excessively drained
Ecological site: Shallow Limy (pe30-36)

General Considerations

Nearly all areas are used as range. Because of a severe hazard of water erosion, this soil is generally unsuited to cultivated crops. It is better suited to range. The dominant native vegetation is big bluestem, little bluestem, and Indiangrass. Overgrazed areas are dominated by blue grama, buffalograss, and sideoats grama. Water erosion is a hazard if range is overgrazed. In some areas gullies form along cattle trails. An adequate plant cover helps prevent excessive soil loss. Fencing and other means of controlling livestock traffic patterns can be used to prevent the formation of gullies and to give gullies time to revegetate. Proper stocking rates, a uniform distribution of grazing, and scheduled timely deferment of grazing during the growing season help keep the range in good condition.

In a few areas, part of the vegetation is oak, ash, and hackberry. This vegetation provides habitat for many types of wildlife species, including quail, deer, rabbits, squirrels, and numerous songbirds. Proper grazing use and establishment of feed areas increase the wildlife population.

This soil is moderately well suited to dwellings. The shrink-swell potential and the slope are limitations on sites for dwellings. Properly designing and reinforcing foundations, installing sealed foundation drains, and backfilling with suitable coarse textured material help to prevent structural damage caused by shrinking and swelling.

This soil is moderately well suited to septic tank absorption fields and is poorly suited to sewage lagoons. The slope is a limitation that affects both uses. The moderate permeability restricts the absorption of effluent in septic tank absorption fields. It can be overcome by enlarging the field. Seepage is a limitation on sites for sewage lagoons. Seepage can be controlled by sealing the lagoon. If the less sloping areas are selected as site for lagoons, less leveling and banking will be needed during construction.

3880—Holder silt loam, 1 to 3 percent slopes

This very deep, gently sloping, well drained soil is on ridgetops. Individual areas are irregular in shape and range from 10 to 200 acres in size.

Map Unit Composition

Holder: 95 percent
Minor components: 5 percent

Component Descriptions

Holder

Landform: Hillslopes on uplands
Hillslope position: Summits and shoulders
Parent material: Silty loess
Slope: 1 to 3 percent
Drainage class: Well drained
Slowest permeability: Moderate (about 0.60 inch per hour)
Available water capacity: Very high (about 12.1 inches)
Shrink-swell potential: Moderate (about 5.1 LEP)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal zone of saturation: More than 6 feet
Surface runoff class: Low

Ecological site: Loamy Upland (pe25-34)
Land capability (nonirrigated): 2e

Typical profile:
A—0 to 8 inches; silt loam
BA—8 to 14 inches; silt loam
Bt—14 to 45 inches; silty clay loam
BC—45 to 58 inches; silty clay loam
Ck—58 to 60 inches; silt loam

Component note: Included with this soil in mapping are small areas of Crete soils. Crete soils contain more clay in the subsoil and are on nearly level or slightly depressional areas. Included soils make up about 5 percent of the map unit.

Minor components

Crete
Extent: About 5 percent of the unit
Landform: Hillslopes on uplands
Slope: 1 to 4 percent
Drainage class: Moderately well drained
Ecological site: Clay Upland (pe25-34)

General Considerations

About half of the acreage is used for cultivated crops, and half is used for range or wildlife habitat. This soil is well suited to wheat, grain sorghum, alfalfa, and soybeans. Water erosion is a hazard if cultivated crops are grown. Terraces, grassed waterways, and contour farming help prevent excessive soil loss. A system of conservation tillage that leaves all or part of the crop residue on the surface improves fertility and tilth and increases the rate of water infiltration.

This soil is suited to range. The dominant native vegetation is big bluestem, little bluestem, and switchgrass. Overgrazed areas are dominated by blue grama, buffalograss, and sideoats grama. Proper stocking rates, a uniform distribution of grazing, and scheduled timely deferment of grazing during the growing season help keep the range in good condition.

This soil is moderately well suited to dwellings. The shrink-swell potential is a limitation on sites for dwellings. Properly designing and reinforcing foundations, installing sealed foundation drains, and backfilling with suitable coarse textured material help to prevent structural damage caused by shrinking and swelling.

This soil is moderately well suited to septic tank absorption fields and sewage lagoons. The moderate permeability restricts the absorption of effluent in septic tank absorption fields. It can be overcome by enlarging the field. Seepage and slope are a limitation on sites for sewage lagoons. Seepage can be controlled by sealing the lagoon. If the less sloping areas are selected as sites for lagoons, less leveling and banking will be needed during construction.

3882—Holder silt loam, 3 to 7 percent slopes

This very deep, moderately sloping, well drained soil is on side slopes along creeks and river valleys. Individual areas are irregular in shape and range from 10 to several hundred acres in size.

Map Unit Composition

Holder: 85 percent
Minor components: 15 percent

Component Descriptions

Holder

Landform: Hillslopes on uplands
Hillslope position: Backslopes
Parent material: Silty loess
Slope: 3 to 7 percent
Drainage class: Well drained
Slowest permeability: Moderate (about 0.60 inch per hour)
Available water capacity: Very high (about 12.1 inches)
Shrink-swell potential: Moderate (about 5.1 LEP)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal zone of saturation: More than 6 feet
Surface runoff class: Medium
Ecological site: Loamy Upland (pe25-34)
Land capability (nonirrigated): 3e

Typical profile:
A—0 to 8 inches; silt loam
BA—8 to 14 inches; silt loam
Bt—14 to 45 inches; silty clay loam
BC—45 to 58 inches; silty clay loam
Ck—58 to 60 inches; silt loam

Component note: Included with this soil in mapping are small areas of Clime and Crete soils. The moderately deep Clime soils are on middle and lower side slopes. The Crete soils contain more clay in the subsoil and are on the upper parts of side slopes.

Minor components

Crete
Extent: About 13 percent of the unit
Landform: Hillslopes on uplands
Slope: 3 to 8 percent
Drainage class: Moderately well drained
Ecological site: Clay Upland (pe25-34)

Clime
Extent: About 2 percent of the unit
Landform: Hillslopes on uplands
Slope: 3 to 8 percent
Depth to restrictive feature: 20 to 40 inches to bedrock (paralithic)
Drainage class: Well drained
Ecological site: Limy Upland (pe30-36)

General Considerations

About half of the acreage is used for cultivated crops, and half is used for range or wildlife habitat. This soil is moderately well suited to wheat, grain sorghum, and soybeans. Water erosion is a hazard if cultivated crops are grown. Terraces, grassed waterways, and contour farming help prevent excessive soil loss. A system of conservation tillage that leaves all or part of the crop residue on the surface improves fertility and tilth and increases the rate of water infiltration.

This soil is suited to range. The dominant native vegetation is big bluestem, little bluestem, and switchgrass. Overgrazed areas are dominated by blue grama, buffalograss, and sideoats grama. Water erosion is a hazard if range is overgrazed. In

some areas, gullies form along cattle trails. An adequate plant cover helps prevent excessive soil loss. Fencing and other means of controlling livestock traffic patterns can be used to prevent the formation of gullies and to give gullies time to revegetate. Proper stocking rates, uniform distribution of grazing, and scheduled timely deferment of grazing during the growing season help keep the range in good condition.

This soil is moderately well suited to dwellings. The shrink-swell potential is a limitation. Properly designing and reinforcing foundations, installing sealed foundation drains, and backfilling with suitable coarse textured material help to prevent structural damage caused by shrinking and swelling.

This soil is moderately well suited to septic tank absorption fields and sewage lagoons. The moderate permeability restricts the absorption of effluent in septic tank absorption fields. It can be overcome by enlarging the field. Seepage and slope are limitations on sites for sewage lagoons. Seepage can be controlled by sealing the lagoon. If the less sloping areas are selected as sites for lagoons, less leveling and banking will be needed during construction.

3890—Ladysmith silty clay loam, 0 to 1 percent slopes

This very deep, nearly level, somewhat poorly drained soil is on broad ridgetops. Individual areas are irregular in shape and range from 50 to 500 acres in size.

Map Unit Composition

Ladysmith: 90 percent
Minor components: 10 percent

Component Descriptions

Ladysmith

Landform: Ridges on uplands
Hillslope position: Summits and shoulders
Parent material: Clayey alluvium
Slope: 0 to 1 percent
Drainage class: Somewhat poorly drained
Slowest permeability: Very slow (about 0.0015 inch per hour)
Available water capacity: Moderate (about 8.7 inches)
Shrink-swell potential: Very high (about 9.0 LEP)
Flooding hazard: None
Ponding frequency: Occasional
Depth to seasonal zone of saturation: More than 6 feet
Surface runoff class: Very high
Ecological site: Clay Upland (pe30-36)
Land capability (nonirrigated): 2s

Typical profile:
A—0 to 7 inches; silty clay loam
Bt1—7 to 15 inches; silty clay
Bt2—15 to 30 inches; silty clay
BCk—30 to 38 inches; silty clay
C—38 to 60 inches; silty clay

Component note: Included with this soil in mapping are small areas of the moderately well drained Konza soils and slick spots. Konza soils have a thinner surface and are on similar positions as the Ladysmith soil. The slick spots have a thinner surface and more exchangeable sodium in the subsoil and are in slight depressions.

Minor components

Konza
Extent: About 10 percent of the unit
Landform: Ridges on uplands
Slope: 1 to 2 percent
Drainage class: Moderately well drained
Ecological site: Clay Pan (pe30-36)

General Considerations

Nearly all of the acreage is used for cultivated crops. This soil is well suited to wheat, soybeans, grain sorghum, and alfalfa. In some years crop yields are reduced by wetness. Yields can also be reduced during periods of drought because the clayey subsoil does not readily release water to plants. Water erosion is a hazard if cultivated crops are grown. A system of conservation tillage that leaves all or part of the crop residue on the surface improves fertility and tilth and increases the rate of water infiltration.

This soil is suited to tame and native grasses. The native vegetation is dominantly big bluestem, little bluestem, and switchgrass. If the range is overgrazed these grasses are replaced by less desirable grasses and by weeds, such as tall dropseed, broomweed, and western ragweed. Grazing when the soil is too wet causes surface compacting. Proper stocking rates, uniform distribution of grazing, and scheduled timely deferment of grazing during the growing season help keep the range in good condition. Timely mowing of these grasses for hay allows the plants to recover and store food before the first frost. Applications of fertilizer are generally needed to improve the vigor, quality, and quantity of tame grasses.

This soil is poorly suited to dwellings. The shrink-swell potential is a limitation on sites for dwellings with or without basements. Also, wetness is a limitation on sites for dwellings with basements. Properly designing and reinforcing foundations, installing sealed foundation drains, and backfilling with coarse textured material around the foundation help to prevent the structural damage caused by wetness and by shrinking and swelling.

This soil is generally unsuited to septic tank absorption fields because of wetness and very slow permeability. This soil is well suited to sewage lagoons.

3934—Valentine loamy fine sand, 5 to 15 percent slopes

This very deep, rolling, excessively drained soil is on uplands. Individual areas are irregular in shape and range from 10 to 100 acres in size.

Map Unit Composition

Valentine: 87 percent
Minor components: 13 percent

Component Descriptions

Valentine

Landform: Dunes on uplands
Parent material: Sandy eolian sands
Slope: 5 to 15 percent
Drainage class: Excessively drained
Slowest permeability: Rapid (about 5.95 inches per hour)
Available water capacity: Low (about 5.6 inches)
Shrink-swell potential: Low (0.0 LEP)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal zone of saturation: More than 6 feet
Surface runoff class: Very low

Ecological site: Sandy (pe25-34)
Land capability (nonirrigated): 6e

Typical profile:
A—0 to 5 inches; loamy fine sand
C1—5 to 50 inches; loamy sand
C2—50 to 60 inches; sand

Component note: Included with this soil in mapping are small areas of Clime, Ortello, Longford, and Wells soils. The moderately deep Clime soils formed in shale and are below the Valentine soil. The Ortello and Wells soils contain less sand throughout and are in positions on the landscape similar to those of the Valentine soil. The Longford soils contain more clay in the subsoil and are on gently sloping areas below the Valentine soil.

Minor components

Ortello
Extent: About 5 percent of the unit
Landform: Hillslopes on uplands
Slope: 1 to 4 percent
Drainage class: Well drained
Ecological site: Sandy (pe25-34)

Wells
Extent: About 5 percent of the unit
Landform: Hillslopes on uplands
Slope: 1 to 4 percent
Drainage class: Well drained
Ecological site: Loamy Upland (pe25-34)

Longford
Extent: About 2 percent of the unit
Landform: Hillslopes on uplands
Slope: 1 to 3 percent
Drainage class: Well drained
Ecological site: Loamy Upland (pe25-34)

Clime
Extent: About 1 percent of the unit
Landform: Hillslopes on uplands
Slope: 3 to 8 percent
Depth to restrictive feature: 20 to 40 inches to bedrock (paralithic)
Drainage class: Well drained
Ecological site: Limy Upland (pe30-36)

General Considerations

This soil is suited to range and tame grass pasture. The native vegetation is dominantly sand bluestem, little bluestem, Indiangrass, and blue grama. Overgrazing causes deterioration of the plant community and increases the hazard of soil blowing. Under these conditions the more desirable grasses are replaced by less desirable grasses and by weeds. Proper stocking rates, uniform distribution of grazing, and timely deferment of grazing help keep the range in good condition. Potential pond reservoir sites are limited on this soil. Application of fertilizer and timely mowing of tame grass increases the vigor, quality, and quantity of the grass plants.

This soil is moderately well suited to dwellings because of the slope. This soil is poorly suited to septic tank absorption fields and sewage lagoons because of seepage

and the slope. Seepage from lagoons and septic tank absorption fields can contaminate shallow ground water. Sealing the lagoons helps to control seepage.

3936—Wells-Ortello complex, 1 to 4 percent slopes

These very deep, gently sloping, well drained soils are on undulating uplands. The Wells and Ortello soils are so intricately mixed on the landscape that it is not practical to separate them in mapping. The Wells soil is usually on the lower side slopes and the Ortello soil is on the upper slopes. Individual areas are irregular in shape and range from 10 to 250 acres in size.

Map Unit Composition

Wells: 55 percent
Ortello: 30 percent
Minor components: 15 percent

Component Descriptions

Wells

Landform: Hillslopes on uplands
Hillslope position: Backslopes
Parent material: Fine-loamy residuum
Slope: 1 to 4 percent
Drainage class: Well drained
Slowest permeability: Moderate (about 0.60 inch per hour)
Available water capacity: High (about 10.4 inches)
Shrink-swell potential: Moderate (about 4.9 LEP)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal zone of saturation: More than 6 feet
Surface runoff class: Low
Ecological site: Loamy Upland (pe25-34)
Land capability (nonirrigated): 3e

Typical profile:
A—0 to 12 inches; loam
BA—12 to 19 inches; clay loam
Bt1—19 to 37 inches; clay loam
Bt2—37 to 51 inches; sandy clay loam
BC—51 to 63 inches; loam

Component note: Included with this soil in mapping are small areas of Clime, Crete, Longford, and Valentine soils. The moderately deep Clime soil is formed in calcareous shale and is on side slopes above the Wells and Ortello soils. The Crete soil contains more clay in the subsoil and is on slopes above the Wells and Ortello soils. The Longford soil contains more clay in the subsoil and is on similar positions in the landscape. Valentine soil contains more sand throughout and is in positions on the landscape similar to those of the Wells and Ortello soils.

Ortello

Landform: Hillslopes on uplands
Parent material: Loamy alluvium and/or loamy eolian deposits
Slope: 1 to 4 percent
Drainage class: Well drained

Slowest permeability: Moderately rapid (about 2.00 inches per hour)
Available water capacity: High (about 9.0 inches)
Shrink-swell potential: Low (about 0.5 LEP)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal zone of saturation: More than 6 feet
Surface runoff class: Very low
Ecological site: Sandy (pe25-34)
Land capability (nonirrigated): 3e

Typical profile:
Ap—0 to 6 inches; sandy loam
A—6 to 15 inches; sandy loam
Bw—15 to 34 inches; sandy loam
C—34 to 60 inches; sandy loam

Minor components

Longford
Extent: About 12 percent of the unit
Landform: Hillslopes on uplands
Slope: 1 to 3 percent
Drainage class: Well drained
Ecological site: Loamy Upland (pe25-34)

Clime
Extent: About 1 percent of the unit
Landform: Hillslopes on uplands
Slope: 3 to 8 percent
Depth to restrictive feature: 20 to 40 inches to bedrock (paralithic)
Drainage class: Well drained
Ecological site: Limy Upland (pe30-36)

Valentine
Extent: About 1 percent of the unit
Landform: Dunes on uplands
Slope: 5 to 15 percent
Drainage class: Excessively drained
Ecological site: Sandy (pe25-34)

Crete
Extent: About 1 percent of the unit
Landform: Hillslopes on uplands
Slope: 1 to 4 percent
Drainage class: Moderately well drained
Ecological site: Clay Upland (pe25-34)

General Considerations

Most of the acreage is used for cultivated crops. These soils are well suited to wheat, grain sorghum, soybeans, and alfalfa. Water erosion is a hazard if cultivated crops are grown. Terraces, grassed waterways, and contour farming help prevent excessive soil loss. A system of conservation tillage that leaves all or part of the crop residue on the surface improves fertility and tilth and increases the rate of water infiltration.

These soils are suited to range and tame grass pasture. The native vegetation is dominantly big bluestem, little bluestem, and Indiangrass. Overgrazing reduces plant cover and causes deterioration of the plant community. Under these conditions the

more desirable grasses are replaced by less desirable grasses and weeds. Proper stocking rates, uniform grazing distribution, and timely deferment of grazing help keep the range in good condition. Brush and trees have invaded some areas. Controlled burning in the spring, proper use of chemicals, and selective cutting help to control woody plants. Application of fertilizer and timely mowing of tame grass pasture increase plant vigor and quality and quantity of forage.

Wells soil is moderately well suited to dwellings and sewage lagoons. It is well suited to septic tank absorption fields. Shrink-swell potential in the subsoil is a limitation on sites for dwellings. Properly designing and reinforcing foundations, installing sealed foundation drains, and backfilling with suitable coarse textured material help to prevent structural damage caused by shrinking and swelling. Seepage and the slope are limitations on sites for sewage lagoons. Sealing the lagoon helps reduce seepage. If the less sloping areas are selected as sites for lagoons, less leveling and banking will be needed during construction. Ortello soil is well suited to dwellings and is generally unsuited for septic tank absorption fields and sewage lagoons because of seepage. Overcoming this hazard is difficult without major control measures.

3938—Wells-Ortello complex, 4 to 8 percent slopes

These very deep, moderately sloping, well drained soils are on undulating uplands. Individual areas are irregular in shape and range from 10 to 200 acres in size. The two soils occur as areas so intricately mixed or so small that mapping them separately is impractical.

Map Unit Composition

Wells: 55 percent
Ortello: 30 percent
Minor components: 15 percent

Component Descriptions

Wells

Landform: Hillslopes on uplands
Hillslope position: Backslopes
Parent material: Fine-loamy residuum
Slope: 4 to 8 percent
Drainage class: Well drained
Slowest permeability: Moderate (about 0.60 inch per hour)
Available water capacity: High (about 10.4 inches)
Shrink-swell potential: Moderate (about 4.9 LEP)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal zone of saturation: More than 6 feet
Surface runoff class: Medium
Ecological site: Loamy Upland (pe25-34)
Land capability (nonirrigated): 4e

Typical profile:
A—0 to 12 inches; loam
BA—12 to 19 inches; clay loam
Bt1—19 to 37 inches; clay loam
Bt2—37 to 51 inches; sandy clay loam
BC—51 to 63 inches; loam

Component note: Included with these soils in mapping are small areas of Clime and Longford soils. The moderately deep Clime soil formed in calcareous shales. It is on side slopes below the Wells and Ortello soils. The Longford soil contains more clay in the subsoil than the Wells and Ortello soils. It is in the less sloping areas below the Wells and Ortello soils.

Ortello

Landform: Hillslopes on uplands
Parent material: Loamy alluvium and/or loamy eolian deposits
Slope: 4 to 8 percent
Drainage class: Well drained
Slowest permeability: Moderately rapid (about 2.00 inches per hour)
Available water capacity: High (about 9.0 inches)
Shrink-swell potential: Low (about 0.5 LEP)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal zone of saturation: More than 6 feet
Surface runoff class: Low
Ecological site: Sandy (pe25-34)
Land capability (nonirrigated): 4e

Typical profile:
Ap—0 to 6 inches; sandy loam
A—6 to 15 inches; sandy loam
Bw—15 to 34 inches; sandy loam
C—34 to 60 inches; sandy loam

Minor components

Longford
Extent: About 14 percent of the unit
Landform: Hillslopes on uplands
Slope: 1 to 3 percent
Drainage class: Well drained
Ecological site: Loamy Upland (pe25-34)

Clime
Extent: About 1 percent of the unit
Landform: Hillslopes on uplands
Slope: 3 to 8 percent
Depth to restrictive feature: 20 to 40 inches to bedrock (paralithic)
Drainage class: Well drained
Ecological site: Limy Upland (pe30-36)

General Considerations

About 60 percent of the acreage is used for cropland. These soils are well suited to wheat, grain sorghum, soybeans, and alfalfa. Water erosion is a hazard if cultivated crops are grown. Terraces, grassed waterways, and contour farming help prevent excessive soil loss. A system of conservation tillage that leaves all or part of the crop residue on the surface improves fertility and tilth and increases the rate of water infiltration.

These soils are suited to rangeland and tame grass pasture. The native vegetation is dominantly big bluestem, little bluestem, and Indiangrass. Overgrazing reduces plant cover and causes deterioration of the plant community. Under these conditions, the more desirable grasses are replaced by less desirable grasses and weeds. Proper stocking rates, uniform grazing distribution, and timely deferment of grazing help keep

the grass in good condition. Brush and trees have invaded some areas. Timely burning, proper use of chemicals, and selective cutting help to control these plants. Application of fertilizer and timely mowing of tame grass increase plant vigor, quality, and quantity.

Wells soil is moderately well suited to dwellings and sewage lagoons. It is well suited to septic tank absorption fields. Shrink-swell potential in the subsoil is a limitation on sites for dwellings. Properly designing and reinforcing foundations, installing sealed foundation drains, and backfilling with suitable coarse textured material help to prevent structural damage caused by shrinking and swelling.
Seepage and slope are limitations on sites for sewage lagoons. Sealing the lagoon helps reduce seepage. If the less sloping areas are selected as sites for lagoons, less leveling and banking will be needed during construction. Ortello soil is well suited to dwellings and is generally unsuited for septic tank absorption fields and sewage lagoons because of seepage. Overcoming this hazard is difficult without major control measures.

4150—Kahola silt loam, channeled

This very deep, nearly level, well drained soil is on narrow, low flood plains that are dissected by stream channels. It is frequently flooded for very brief periods. Individual areas range from 150 to 800 feet wide and from 500 feet to more than a mile in length. These areas range from 25 to 150 acres in size.

Map Unit Composition

Kahola: 85 percent
Minor components: 15 percent

Component Descriptions

Kahola

Landform: Flood plains on meander belts
Parent material: Silty alluvium
Slope: 0 to 2 percent
Drainage class: Well drained
Slowest permeability: Moderate (about 0.60 inch per hour)
Available water capacity: Very high (about 12.9 inches)
Shrink-swell potential: Moderate (about 4.0 LEP)
Flooding frequency: Frequent
Ponding hazard: None
Depth to seasonal zone of saturation: More than 6 feet
Surface runoff class: Low
Ecological site: Loamy Lowland (pe30-36)
Land capability (nonirrigated): 5w

Typical profile:
A1—0 to 24 inches; silt loam
A2—24 to 36 inches; silt loam
AC—36 to 44 inches; silt loam
C—44 to 60 inches; silt loam

Component note: Included with this soil in mapping are small areas of Tully soils and soils that have greater than 35 percent gravel below a depth of 12 inches. The Tully soils contain more clay in the subsoil and are on footslopes in adjoining uplands. Also included with this soil in mapping are steep stream channels, rock and gravel bars, and scour plains. Other included soils are calcareous to the surface.

Minor components

Tully
Extent: About 15 percent of the unit
Landform: Hillslopes on uplands
Slope: 3 to 8 percent
Drainage class: Well drained
Ecological site: Loamy Upland (pe30-36)

General Considerations

The majority of the acreage is used as range or wildlife habitat. A few areas are used for cultivated crops. However, this soil is generally unsuited to cultivated crops because of flooding. It is also difficult to use machinery along the meandering stream channels.

This soil is better suited to range and tame grass pasture. Control of brush and distribution of grazing are the main concerns of management. In some areas the range is overgrazed and in poor condition because it is near water and shade trees where livestock congregate. In these areas, the more productive grasses are replaced by less productive grasses and by weeds. Rotation grazing and restricting grazing to the winter months help to maintain the range in good condition. Controlled burning, proper use of chemicals, and selective cutting help to control woody plants.

This soil is well suited to timber and firewood production. Trees best suited to planting are black walnut, hackberry, green ash, and eastern cottonwood. Competition from less desirable trees and shrubs is the main concern for management.

The vegetation commonly growing on this soil provides habitat for many types of wildlife species, including quail, deer, rabbits, and numerous songbirds. The wildlife population can be increased by establishing more fringe areas where woodland is adjacent to cropland.

This soil is generally unsuited to building site development because of flooding. Overcoming this hazard is difficult without major flood-control measures.

4151—Kahola silt loam, occasionally flooded

This very deep, nearly level, well drained soil is on narrow flood plains that are dissected by stream channels. Individual areas range from 150 to 800 feet wide and from 500 feet to more than a mile in length. They range from 25 to 150 acres in size.

Map Unit Composition

Kahola: 90 percent
Minor components: 10 percent

Component Descriptions

Kahola

Landform: Flood plains in valleys
Parent material: Silty alluvium
Slope: 0 to 2 percent
Drainage class: Well drained
Slowest permeability: Moderate (about 0.60 inch per hour)
Available water capacity: Very high (about 12.9 inches)
Shrink-swell potential: Moderate (about 4.0 LEP)
Flooding frequency: Occasional
Ponding hazard: None
Depth to seasonal zone of saturation: More than 6 feet
Surface runoff class: Low

Ecological site: Loamy Lowland (pe30-36)
Land capability (nonirrigated): 2w

Typical profile:
A1—0 to 24 inches; silt loam
A2—24 to 36 inches; silt loam
AC—36 to 44 inches; silt loam
C—44 to 60 inches; silt loam

Component note: Included with this soil in mapping are small areas of Reading and Tully soils. The Tully soils contain more clay in the subsoil and are on footslopes in adjoining uplands. Also included with this soil in mapping are steep stream channels and short, steep escarpments to adjoining higher or lower bottom lands. Other included soils are calcareous to the surface.

Minor components

Tully
Extent: About 10 percent of the unit
Landform: Hillslopes on uplands
Slope: 3 to 8 percent
Drainage class: Well drained
Ecological site: Loamy Upland (pe30-36)

General Considerations

About half of the acreage is used for cultivated crops the rest is range or wildlife habitat. This soil is well suited to wheat, sorghum, soybeans, and alfalfa. Crop yields are reduced in some years because of flooding. The main management concern is maintenance of fertility and tilth. A system of conservation tillage that leaves all or part of the crop residue on the surface improves fertility and tilth and increases the rate of water infiltration.

The vegetation commonly growing on this soil provides habitat for many types of wildlife species, including quail, deer, rabbits, turkeys, and numerous songbirds. The wildlife population can be increased by establishing more fringe areas where woodland is adjacent to cropland.

This soil is well suited to timber and firewood production. Trees best suited to planting are black walnut, hackberry, green ash, and eastern cottonwood. Competition from less desirable trees and shrubs is the main concern for management.

This soil is generally unsuited to dwellings, septic tank absorption fields, and sewage lagoons because of the hazard of flooding. Dikes, levees, and other structures lessen this hazard.

4530—Benfield-Florence complex, 5 to 30 percent slopes

These well drained, moderately sloping to steep soils are on ridgetops and side slopes that are dissected by many drainageways. The moderately deep Benfield soil is on the more sloping lower side slopes. The deep Florence soil is on shoulder slopes and narrow ridgetops. Many large chert fragments are scattered on the surface. The two soils occur as areas so intricately mixed or so small that mapping them separately is impractical.

Map Unit Composition

Benfield: 43 percent
Florence: 28 percent

Minor components: 29 percent

Component Descriptions

Benfield

Landform: Hillslopes on uplands
Hillslope position: Backslopes
Parent material: Clayey pedisediment derived from limestone and shale over clayey residuum derived from calcareous shale
Slope: 5 to 30 percent
Depth to restrictive feature: 20 to 40 inches to bedrock (paralithic)
Drainage class: Well drained
Slowest permeability: Slow (about 0.06 inch per hour)
Available water capacity: Low (about 5.7 inches)
Shrink-swell potential: High (about 8.9 LEP)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal zone of saturation: More than 6 feet
Surface runoff class: Very high
Ecological site: Loamy Upland (pe30-36)
Land capability (nonirrigated): 6e

Typical profile:
A1—0 to 5 inches; silty clay loam
A2—5 to 10 inches; silty clay loam
Bt1—10 to 19 inches; gravelly silty clay
Bt2—19 to 34 inches; silty clay
2Btk—34 to 38 inches; silty clay
2Cr—38 to 56 inches; weathered bedrock

Component note: Included with these soils in mapping are small areas of Clime, Irwin, Konza, Kahola, and Tully soils. The moderately deep Clime soils are calcareous throughout and are on side slopes. The deep Irwin and Konza soils do not have coarse fragments in the surface soil. They are on the wider ridgetops. The occasionally flooded Kahola soils are on the bottom of deeply entrenched drainageways. The deep, well drained Tully soils are on the lower side slopes and footslopes. Also included, on narrow ridgetops, is a soil that has limestone bedrock at less than 40 inches and has less than 35 percent coarse fragments in the subsoil. Some areas on shoulder slopes and upper backslopes have an outcrop of limestone and a short, steep slope of more than 30 percent.

Florence

Landform: Hillslopes on uplands
Hillslope position: Backslopes
Parent material: Gravelly residuum derived from cherty limestone
Slope: 5 to 15 percent
Depth to restrictive feature: 40 to 60 inches to bedrock (lithic)
Drainage class: Well drained
Slowest permeability: Moderately slow (about 0.20 inch per hour)
Available water capacity: Low (about 4.6 inches)
Shrink-swell potential: Very high (about 9.2 LEP)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal zone of saturation: More than 6 feet
Surface runoff class: High
Ecological site: Loamy Upland (pe30-36)

Land capability (nonirrigated): 6e

Typical profile:
A1—0 to 5 inches; gravelly silt loam
A2—5 to 14 inches; very gravelly silty clay
Bt—14 to 48 inches; very cobbly clay
Btk—48 to 56 inches; extremely cobbly clay
R—56 to 60 inches; unweathered bedrock

Minor components

Clime
Extent: About 10 percent of the unit
Landform: Hillslopes on uplands
Slope: 20 to 40 percent
Depth to restrictive feature: 20 to 40 inches to bedrock (paralithic)
Drainage class: Well drained
Ecological site: Limy Upland (pe30-36)

Konza
Extent: About 10 percent of the unit
Landform: Ridges on uplands
Slope: 1 to 3 percent
Drainage class: Moderately well drained
Ecological site: Clay Pan (pe30-36)

Labette
Extent: About 3 percent of the unit
Landform: Hillslopes on uplands
Slope: 0 to 4 percent
Depth to restrictive feature: 20 to 40 inches to bedrock (lithic)
Drainage class: Well drained
Ecological site: Loamy Upland (pe30-36)

Irwin
Extent: About 2 percent of the unit
Landform: Hillslopes on uplands
Slope: 3 to 7 percent
Drainage class: Moderately well drained
Ecological site: Clay Upland (pe30-36)

Tully
Extent: About 2 percent of the unit
Landform: Hillslopes on uplands
Slope: 8 to 15 percent
Drainage class: Well drained
Ecological site: Loamy Upland (pe30-36)

Kahola
Extent: About 1 percent of the unit
Landform: Flood plains on meander belts
Slope: 0 to 2 percent
Drainage class: Well drained
Ecological site: Loamy Lowland (pe30-36)

Rock outcrop
Extent: About 1 percent of the unit

General Considerations

Most areas are used as range. Because the chert fragments interfere with tillage and erosion is a hazard, these soils are generally unsuited to cultivated crops. They are better suited to rangeland.

The native vegetation is dominantly big bluestem, little bluestem, and Indiangrass. Overgrazing reduces the extent of the plant cover and causes deterioration of the plant community. Under these conditions, the more productive grasses are replaced by less productive grasses and by weeds, such as tall dropseed, Baldwin ironweed, and western ragweed. Proper stocking rates, a uniform distribution of grazing, timely deferment of grazing, timely burning, and rotation grazing help to keep the range in good condition. Controlled burning in late spring helps to control woody plants and removes old thatch. Well distributed watering and salting facilities and properly located fences improve the distribution of grazing. Suitable sites for stock-water ponds are not readily available. They generally are available in areas of the included Tully soils.

The Florence soil is moderately well suited to dwelling sites. The shrink-swell potential, the slope, and the content of chert fragments are limitations on sites for dwellings without basements. Also, the depth to bedrock is a limitation on sites for dwellings with basements. Using properly designed and reinforced foundations, installing foundation drains, and backfilling with suitable coarse textured material help to prevent the structural damage caused by shrinking and swelling.

The Florence soil is generally unsuitable as a site for septic tank absorption fields. The restricted permeability is a severe limitation. The slope is a severe limitation on sites for sewage lagoons.

The Benfield soil is poorly suited to dwellings. The shrink-swell potential and the slope are limitations on sites for dwellings with or without basements. Also, the depth to bedrock is a limitation on sites for dwellings with basements.

The Benfield soil is generally unsuited to septic absorption fields. The depth to bedrock and the restricted permeability are severe limitations on sites for sewage lagoons.

4550—Clime silty clay loam, 20 to 40 percent slopes, very stony

This moderately deep, steep, well drained soil is on breaks and side slopes. Many limestone rocks are scattered over the surface. The rocks are irregular in shape and range from 1 to 3 feet in diameter. They cover less than 3 percent of the surface and are 3 to 40 feet apart.

Map Unit Composition

Clime: 86 percent
Minor components: 14 percent

Component Descriptions

Clime

Landform: Hillslopes on uplands
Hillslope position: Backslopes
Parent material: Silty and clayey residuum derived from shale, calcareous
Slope: 20 to 40 percent
Surface fragments: About 0 to 3 percent angular stones
Depth to restrictive feature: 20 to 40 inches to bedrock (paralithic)
Drainage class: Well drained

Slowest permeability: Slow (about 0.06 inch per hour)
Available water capacity: Low (about 5.3 inches)
Shrink-swell potential: High (about 8.4 LEP)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal zone of saturation: More than 6 feet
Surface runoff class: Very high
Ecological site: Limy Upland (pe30-36)
Land capability (nonirrigated): 7e

Typical profile:
A1—0 to 2 inches; stony silty clay loam
A2—2 to 9 inches; silty clay
Bw—9 to 27 inches; silty clay
C—27 to 33 inches; silty clay
Cr—33 to 37 inches; weathered bedrock

Component note: Included with this soil in mapping are small areas of Kahola, Sogn, and Tully soils and rock outcrop. The deep Kahola soils are on the bottom of deeply entrenched drainageways. The shallow Sogn soils are in the less sloping areas above the rock outcrop. The deep Tully soils are on footslopes. The rock outcrop is in narrow bands on the contour.

Minor components

Tully
Extent: About 8 percent of the unit
Landform: Hillslopes on uplands
Slope: 8 to 15 percent
Drainage class: Well drained
Ecological site: Loamy Upland (pe30-36)

Rock outcrop
Extent: About 4 percent of the unit

Sogn
Extent: About 1 percent of the unit
Landform: Hillslopes on uplands
Slope: 1 to 20 percent
Depth to restrictive feature: 4 to 20 inches to bedrock (lithic)
Drainage class: Somewhat excessively drained
Ecological site: Shallow Limy (pe30-36)

Kahola
Extent: About 1 percent of the unit
Landform: Flood plains on meander belts
Slope: 0 to 2 percent
Drainage class: Well drained
Ecological site: Loamy Lowland (pe30-36)

General Considerations

Nearly all of the acreage is used as range or is wooded. Because of a severe hazard of erosion, the slope, and the many stones on the surface, this soil is unsuited to cultivated crops and poorly suited to wood production. It is better suited to range.

The native vegetation is dominantly big bluestem, little bluestem, Indiangrass, and sideoats grama. Trees and brush have invaded some areas. As a result, brush control is needed to increase forage production. Controlled burning in late spring helps to control woody plants. Properly applied chemical sprays and selective cutting also help to

control these plants. Achieving a uniform distribution of grazing is a major management concern. Many areas are grazed infrequently because of the slope and the stones on the surface. Well distributed watering and salting facilities and properly located fences improve the distribution of grazing.

This soil is generally unsuited to building site development because of the slope.

4590—Clime-Sogn complex, 3 to 20 percent slopes

Map Unit Composition (fig. 3)

Clime: 63 percent
Sogn: 20 percent
Minor components: 17 percent

Component Descriptions

Clime

Landform: Hillslopes on uplands
Parent material: Silty and clayey residuum derived from shale, calcareous
Slope: 3 to 20 percent
Depth to restrictive feature: 20 to 40 inches to bedrock (paralithic)
Drainage class: Well drained
Slowest permeability: Slow (about 0.06 inch per hour)
Available water capacity: Low (about 5.2 inches)
Shrink-swell potential: High (about 8.4 LEP)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal zone of saturation: More than 6 feet
Surface runoff class: Very high
Ecological site: Limy Upland (pe30-36)
Land capability (nonirrigated): 6e

Figure 3.—A spring developed in an area of Clime-Sogn complex, 3 to 20 percent slopes.

Typical profile:
A—0 to 12 inches; silty clay loam
Bw—12 to 26 inches; silty clay
C—26 to 30 inches; silty clay
Cr—30 to 34 inches; weathered bedrock

Component note: Included with these soils in mapping are small areas of Irwin, Kahola, Konza, and Tully soils and limestone rock outcrop. The deep, moderately well drained Irwin and Konza soils are on shoulder slopes and ridgetops above the Clime and Sogn soils. The deep, occasionally flooded Kahola soils are on the flood plains of small included drainageways. The deep Tully soils are on footslopes and lower side slopes. The limestone rock outcrop is on breaks, in the steeper areas, and on side slopes generally below the Sogn soil.

Sogn

Landform: Hillslopes on uplands
Parent material: Loamy residuum derived from limestone, unspecified
Slope: 3 to 20 percent
Depth to restrictive feature: 4 to 20 inches to bedrock (lithic)
Drainage class: Somewhat excessively drained
Slowest permeability: Moderate (about 0.60 inch per hour)
Available water capacity: Very low (about 2.0 inches)
Shrink-swell potential: Moderate (about 4.9 LEP)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal zone of saturation: More than 6 feet
Surface runoff class: Medium
Ecological site: Shallow Limy (pe30-36)
Land capability (nonirrigated): 6s

Typical profile:
A—0 to 9 inches; silty clay loam
R—9 to 13 inches; unweathered bedrock

Minor components

Tully
Extent: About 12 percent of the unit
Landform: Hillslopes on uplands
Slope: 8 to 15 percent
Drainage class: Well drained
Ecological site: Loamy Upland (pe30-36)

Konza
Extent: About 2 percent of the unit
Landform: Ridges on uplands
Slope: 1 to 3 percent
Drainage class: Moderately well drained
Ecological site: Clay Pan (pe30-36)

Irwin
Extent: About 2 percent of the unit
Landform: Hillslopes on uplands
Slope: 3 to 7 percent
Drainage class: Moderately well drained
Ecological site: Clay Upland (pe30-36)

Kahola

Extent: About 1 percent of the unit
Landform: Flood plains on meander belts
Slope: 0 to 2 percent
Drainage class: Well drained
Ecological site: Loamy Lowland (pe30-36)

General Considerations

Nearly all of the acreage is used as range, although some areas are wooded. Because of the severe erosion hazard of both soils and the shallow depth to limestone in the Sogn soils, this map unit is generally unsuited to cultivated crops. It is better suited to range. The native vegetation is dominantly big bluestem, little bluestem, and sideoats grama. Sideoats grama is more common on the shallow Sogn soil than on the Clime soil. Overgrazing reduces the extent of the plant cover and causes deterioration of the plant community. Under these conditions, the taller grasses are replaced by less productive grasses and less desirable forbs and grasses, such as blue grama, annual grasses, western ragweed, aromatic sumac, and broomweed. Proper stocking rates, timely deferment of grazing, and uniform distribution of grazing help keep the range in good condition. Trees and brush have invaded in some areas. As a result, brush control is needed to improve the forage production. Controlled burning in the late spring helps to control woody plants. The proper use of chemical sprays and selective cutting also help to control these plants. Well distributed watering and salting facilities and properly located fences improve the distribution of grazing. Suitable sites for stockwater ponds are not readily available. A few areas have potential for spring developments as a source of water.

Because of the depth to bedrock, the restricted permeability, and the slope, the Clime soil is poorly suited to septic tank absorption fields. It is poorly suited to sewage lagoons because of the slope and the depth to bedrock.

The Sogn soil is generally unsuited to building site development because of the shallow depth to bedrock and the slope.

4673—Irwin silty clay loam, 3 to 7 percent slopes

This very deep, moderately sloping, moderately well drained soil is on side slopes. Individual areas are irregular in shape and range from 10 to several thousand acres in size.

Map Unit Composition

Irwin: 86 percent
Minor components: 14 percent

Component Descriptions

Irwin

Landform: Hillslopes on uplands
Hillslope position: Backslopes
Parent material: Silty and clayey alluvium over clayey residuum derived from limestone and shale
Slope: 3 to 7 percent
Drainage class: Moderately well drained
Slowest permeability: Very slow (about 0.0015 inch per hour)
Available water capacity: Moderate (about 8.7 inches)
Shrink-swell potential: High (about 8.9 LEP)
Flooding hazard: None

Ponding hazard: None
Depth to seasonal zone of saturation: More than 6 feet
Surface runoff class: Very high
Ecological site: Clay Upland (pe30-36)
Land capability (nonirrigated): 4e

Typical profile:
A—0 to 6 inches; silty clay loam
BA—6 to 13 inches; silty clay loam
Bt1—13 to 30 inches; silty clay
Btk—30 to 41 inches; silty clay
2Bt2—41 to 72 inches; silty clay

Component note: Included with this soil in mapping are small areas of Clime, Florence, and Konza soils. The moderately deep Clime soils are on side slopes. The deep, gravelly Florence soils are on shoulder slopes and side slopes. The Konza soils have a thinner surface and are on summits and shoulder slopes above the Irwin soil.

Minor components

Konza
Extent: About 10 percent of the unit
Landform: Ridges on uplands
Slope: 1 to 3 percent
Drainage class: Moderately well drained
Ecological site: Clay Pan (pe30-36)

Florence
Extent: About 2 percent of the unit
Landform: Hillslopes on uplands
Slope: 5 to 10 percent
Depth to restrictive feature: 40 to 60 inches to bedrock (lithic)
Drainage class: Well drained
Ecological site: Loamy Upland (pe30-36)

Clime
Extent: About 2 percent of the unit
Landform: Hillslopes on uplands
Slope: 3 to 8 percent
Depth to restrictive feature: 20 to 40 inches to bedrock (paralithic)
Drainage class: Well drained
Ecological site: Limy Upland (pe30-36)

General Considerations

Nearly all of the acreage is used for cultivated crops. The rest is used for range or tame grass pasture. This soil is suited to wheat, alfalfa, grain sorghum, and soybeans. Water erosion is a hazard if cultivated crops are grown. Terraces, grassed waterways, and contour farming help prevent excessive soil loss. A system of conservation tillage that leaves all or part of the crop residue on the surface improves fertility and tilth and increases the rate of water infiltration.

This soil is suited to range and pasture. The native vegetation is dominantly big bluestem, little bluestem, Indiangrass, and switchgrass. Water erosion is a hazard if the range is overgrazed. In some areas gullies form along cattle trails. An adequate plant cover helps prevent excessive soil loss. Fencing and other means of controlling livestock traffic patterns can be used to prevent the formation of gullies and to give gullies time to revegetate. Proper stocking rates, uniform distribution of grazing, and scheduled timely deferment of grazing during the growing season help keep the range in

good condition. Early mowing of hay allows the plants to recover and store food before the first frost. Application of fertilizer increases forage production of tame grass pasture. Invasion of woody plants such as osageorange and eastern redcedar is a problem in some areas. Timely burning helps to control these plants.

This soil is poorly suited to dwellings. The shrink-swell potential is a limitation. Using properly designed and reinforced foundations, installing sealed foundation drains, and backfilling with suitable coarse textured material around the foundations help to prevent the structural damage caused by shrinking and swelling.

This soil is poorly suited to septic tank absorption fields and is moderately well suited to sewage lagoons. The slow permeability restricts the absorption of effluent in septic tank absorption fields. It can be overcome by enlarging the field. The slope is a moderate limitation on sites for sewage lagoons. If the less sloping areas are selected as sites for lagoons, less leveling and banking will be needed during construction.

4735—Konza silty clay loam, 1 to 3 percent slopes

This very deep, gently sloping, moderately well drained soil is on ridgetops and shoulder slopes. Individual areas are irregular in shape and range from 10 to 500 acres in size.

Map Unit Composition

Konza: 85 percent
Minor components: 15 percent

Component Descriptions

Konza

Landform: Ridges on uplands
Hillslope position: Summits and shoulders
Parent material: Silty and clayey loess over silty and clayey pedisediment over clayey residuum derived from limestone and shale
Slope: 1 to 3 percent
Drainage class: Moderately well drained
Slowest permeability: Very slow (about 0.0015 inch per hour)
Available water capacity: Moderate (about 8.8 inches)
Shrink-swell potential: Very high (about 10.0 LEP)
Flooding hazard: None
Ponding frequency: Occasional
Depth to seasonal zone of saturation: More than 6 feet
Surface runoff class: Very high
Ecological site: Clay Pan (pe30-36)
Land capability (nonirrigated): 3e

Typical profile:
A—0 to 6 inches; silty clay loam
Bt1—6 to 28 inches; silty clay
Bt2—28 to 42 inches; silty clay
Bt3—42 to 50 inches; silty clay loam
2Bt4—50 to 70 inches; silty clay loam
3Bt5—70 to 89 inches; clay

Component note: Included with this soil in mapping are small areas of Clime, Florence, Irwin, and Ladysmith soils and slick spots. The moderately deep Clime soils are on side slopes. The deep, gravelly Florence soils are on shoulder slopes and side slopes below the Konza soil. Irwin soils have more than 8 inches of silty clay loam over the heavy silty clay or clay subsoil. The somewhat poorly drained Ladysmith

soils have a grayer subsoil and are on level areas on ridgetops. The slick spots have a thinner surface, more exchangeable sodium in the subsoil than the Konza soil, and are in slight depressions.

Minor components

Irwin
Extent: About 5 percent of the unit
Landform: Hillslopes on uplands
Slope: 3 to 7 percent
Drainage class: Moderately well drained
Ecological site: Clay Upland (pe30-36)

Ladysmith
Extent: About 3 percent of the unit
Landform: Ridges on uplands
Slope: 0 to 2 percent
Drainage class: Somewhat poorly drained
Ecological site: Clay Upland (pe30-36)

Labette
Extent: About 3 percent of the unit
Landform: Hillslopes on uplands
Slope: 0 to 4 percent
Depth to restrictive feature: 20 to 40 inches to bedrock (lithic)
Drainage class: Well drained
Ecological site: Loamy Upland (pe30-36)

Clime
Extent: About 2 percent of the unit
Landform: Hillslopes on uplands
Slope: 3 to 8 percent
Depth to restrictive feature: 20 to 40 inches to bedrock (paralithic)
Drainage class: Well drained
Ecological site: Limy Upland (pe30-36)

Florence
Extent: About 2 percent of the unit
Landform: Hillslopes on uplands
Slope: 5 to 10 percent
Depth to restrictive feature: 40 to 60 inches to bedrock (lithic)
Drainage class: Well drained
Ecological site: Loamy Upland (pe30-36)

General Considerations

Nearly all of the acreage is used for cultivated crops. This soil is suited to wheat, alfalfa, grain sorghum, and soybeans. Water erosion is a hazard if cultivated crops are grown. Terraces, grassed waterways, and contour farming help prevent excessive soil loss. A system of conservation tillage that leaves all or part of the crop residue on the surface improves fertility and tilth and increases the rate of water infiltration.

This soil is suited to range and pasture. The native vegetation is dominantly big bluestem, little bluestem, Indiangrass, and switchgrass. Water erosion is a hazard if the range is overgrazed. In some areas gullies form along cattle trails. An adequate plant cover helps prevent excessive soil loss. Fencing and other means of controlling livestock traffic patterns can be used to prevent the formation of gullies and to give gullies time to revegetate. Proper stocking rates, uniform distribution of grazing, and scheduled timely deferment of grazing during the growing season help keep the range in

good condition. Early mowing of hay allows the plants to recover and store food before the first frost (fig. 4). Application of fertilizer increases forage production of tame grass pasture. Invasion of woody plants such as osageorange and eastern redcedar is a problem in some areas. Timely burning helps to control these plants.

This soil is poorly suited to dwellings. The shrink-swell potential is a limitation. Using properly designed and reinforced foundations, installing sealed foundation drains, and backfilling with suitable coarse textured material around the foundations help to prevent the structural damage caused by shrinking and swelling.

This soil is poorly suited to septic tank absorption fields and is moderately well suited to sewage lagoons. The slow permeability restricts the absorption of effluent in septic tank absorption fields. It can be overcome by enlarging the field. The slope is a moderate limitation on sites for sewage lagoons. If the less sloping areas are selected as sites for lagoons, less leveling and banking will be needed during construction.

4781—Tully silty clay loam, 1 to 3 percent slopes

This very deep, gently sloping, well drained soil is on side slopes and footslopes. Individual areas are irregular in shape and range from 10 to 300 acres in size.

Map Unit Composition

Tully: 85 percent
Minor components: 15 percent

Component Descriptions

Tully

Landform: Hillslopes on uplands
Hillslope position: Footslopes
Parent material: Clayey colluvium

Figure 4.—Native hay in an area of Konza silty clay loam, 1 to 3 percent slopes.

Slope: 1 to 3 percent
Drainage class: Well drained
Slowest permeability: Slow (about 0.06 inch per hour)
Available water capacity: High (about 9.1 inches)
Shrink-swell potential: High (about 8.0 LEP)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal zone of saturation: More than 6 feet
Surface runoff class: High
Ecological site: Loamy Upland (pe30-36)
Land capability (nonirrigated): 2e

Typical profile:
A—0 to 12 inches; silty clay loam
BA—12 to 21 inches; silty clay loam
Bt1—21 to 31 inches; silty clay
Bt2—31 to 40 inches; silty clay
Bt3—40 to 52 inches; silty clay
BC—52 to 60 inches; silty clay

Component note: Included with this soil in mapping are small areas of Clime, Florence, Kahola, and Reading soils. The well drained Clime soils are 20 to 40 inches deep over shale. They occur on side slopes above the Tully soil. The well drained Florence soils contain many chert fragments in the subsoil. They occur on side slopes above the Tully soil. The silty Kahola soils are on flood plains below the Tully soil. The Reading soils contain less clay in the subsoil and are on adjoining high flood plains below the Tully soil.

Minor components

Kahola
Extent: About 6 percent of the unit
Landform: Flood plains on alluvial plains
Slope: 0 to 2 percent
Drainage class: Well drained
Ecological site: Loamy Lowland (pe30-36)

Reading
Extent: About 5 percent of the unit
Landform: Flood plains on alluvial plains
Slope: 0 to 2 percent
Drainage class: Well drained
Ecological site: Loamy Lowland (pe30-36)

Florence
Extent: About 2 percent of the unit
Landform: Hillslopes on uplands
Slope: 5 to 8 percent
Depth to restrictive feature: 40 to 60 inches to bedrock (lithic)
Drainage class: Well drained
Ecological site: Loamy Upland (pe30-36)

Clime
Extent: About 2 percent of the unit
Landform: Hillslopes on uplands
Slope: 1 to 4 percent
Depth to restrictive feature: 20 to 40 inches to bedrock (paralithic)
Drainage class: Well drained

Ecological site: Limy Upland (pe30-36)

General Considerations

About half of the acreage is used for cultivated crops. This soil is well suited to alfalfa, grain sorghum, soybeans, and wheat (fig. 5). Water erosion is a hazard if cultivated crops are grown. Terraces, grassed waterways, and contour farming help prevent excessive soil loss. A system of conservation tillage that leaves all or part of the crop residue on the surface improves fertility and tilth and increases the rate of water infiltration.

This soil is suited to range. The native vegetation is dominantly big bluestem, little bluestem, Indiangrass, and switchgrass. In overgrazed areas, the less productive grasses such as tall dropseed and sideoats grama make up a larger percentage of the plant community. Water erosion is a hazard if range is overgrazed. In some areas gullies form along cattle trails. An adequate plant cover helps prevent excessive soil loss. Fencing and other means of controlling livestock traffic patterns can be used to prevent the formation of gullies and to give gullies time to revegetate. Proper stocking rates, uniform distribution of grazing, and timely deferment of grazing and haying help keep the range in good condition. Early mowing of hay allows the plants to recover and store food before the first frost. Invasion of woody plants such as eastern redcedar and osageorange is a problem in some areas. Timely burning and proper use of chemicals help to control these plants.

This soil is poorly suited to dwellings and septic tank absorption fields. It is moderately well suited to sewage lagoons. The shrink-swell potential is a limitation on sites for dwellings. Properly designing and reinforcing foundations, installing sealed foundation drains, and backfilling with suitable coarse textured material help to prevent structural damage caused by shrinking and swelling. The slow permeability restricts the absorption of effluent in the septic tank absorption fields. It can be overcome by enlarging the field. The

Figure 5.—Soybeans grown on the contour in an area of Tully silty clay loam, 1 to 3 percent slopes.

slope is a limitation on sites for sewage lagoons. If the less sloping areas are selected as sites for lagoons, less leveling and banking will be needed during construction.

4783—Tully silty clay loam, 3 to 7 percent slopes

This very deep, moderately sloping, well drained soil is on side slopes and footslopes. Individual areas are irregular in shape and range from 10 to 300 acres in size.

Map Unit Composition

Tully: 85 percent
Minor components: 15 percent

Component Descriptions

Tully

Landform: Hillslopes on uplands
Hillslope position: Footslopes
Parent material: Clayey colluvium
Slope: 3 to 7 percent
Drainage class: Well drained
Slowest permeability: Slow (about 0.06 inches per hour)
Available water capacity: High (about 9.1 inches)
Shrink-swell potential: High (about 8.0 LEP)
Flooding hazard: None
Ponding hazard: None
Depth to seasonal zone of saturation: More than 6 feet
Surface runoff class: Very high
Ecological site: Loamy Upland (pe30-36)
Land capability (nonirrigated): 3e

Typical profile:
A—0 to 12 inches; silty clay loam
BA—12 to 21 inches; silty clay loam
Bt1—21 to 31 inches; silty clay
Bt2—31 to 40 inches; silty clay
Bt3—40 to 52 inches; silty clay
BC—52 to 60 inches; silty clay

Component note: Included with this soil in mapping are small areas of Benfield, Clime, Florence, Kahola, and Reading soils. The moderately deep Benfield and Clime soils are on side slopes above the Tully soil. The well drained Florence soils contain many chert fragments in the subsoil. They occur on side slopes above the Tully soil. The silty Kahola soils are on flood plains below the Tully soil. The Reading soils contain less clay in the subsoil and are on high flood plains below the Tully soil. Also included are steep breaks adjacent to and at the head slopes of entrenched drainageways.

Minor components

Kahola
Extent: About 6 percent of the unit
Landform: Flood plains on alluvial plains
Slope: 0 to 2 percent
Drainage class: Well drained
Ecological site: Loamy Lowland (pe30-36)

Reading
Extent: About 3 percent of the unit

Landform: Flood plains on alluvial plains
Slope: 0 to 2 percent
Drainage class: Well drained
Ecological site: Loamy Lowland (pe30-36)

Benfield
Extent: About 2 percent of the unit
Landform: Hillslopes on uplands
Slope: 5 to 15 percent
Depth to restrictive feature: 20 to 40 inches to bedrock (paralithic)
Drainage class: Well drained
Ecological site: Loamy Upland (pe30-36)

Florence
Extent: About 2 percent of the unit
Landform: Hillslopes on uplands
Slope: 5 to 15 percent
Depth to restrictive feature: 40 to 60 inches to bedrock (lithic)
Drainage class: Well drained
Ecological site: Loamy Upland (pe30-36)

Clime
Extent: About 2 percent of the unit
Landform: Hillslopes on uplands
Slope: 3 to 8 percent
Depth to restrictive feature: 20 to 40 inches to bedrock (paralithic)
Drainage class: Well drained
Ecological site: Limy Upland (pe30-36)

General Considerations

Nearly all of the acreage is used as rangeland and native hay. The remaining acreage is used for cultivated crops. This soil is well suited to alfalfa, grain sorghum, soybeans, and wheat. Water erosion is a hazard if cultivated crops are grown. Terraces, grassed waterways, and contour farming help prevent excessive soil loss. A system of conservation tillage that leaves all or part of the crop residue on the surface improves fertility and tilth and increases the rate of water infiltration.

This soil is suited to range. The native vegetation is dominantly big bluestem, little bluestem, Indiangrass, and switchgrass. In overgrazed areas the less productive grasses such as tall dropseed and sideoats grama make up a larger percentage of the plant community. Water erosion is a hazard if range is overgrazed. In some areas gullies form along cattle trails. An adequate plant cover helps prevent excessive soil loss. Fencing and other means of controlling livestock traffic patterns can be used to prevent the formation of gullies and to give gullies time to revegetate. Proper stocking rates, uniform distribution of grazing, and timely deferment of grazing and haying help keep the range in good condition. Suitable sites for stock-water ponds generally are available. Early mowing of hay allows the plants to recover and store food before the first frost. Invasion of woody plants such as eastern redcedar and osageorange is a problem in some areas. Timely burning and proper use of chemicals help to control these plants.

This soil is poorly suited to dwellings and septic tank absorption fields. It is moderately well suited to sewage lagoons. The shrink-swell potential is a limitation on sites for dwellings. Properly designing and reinforcing foundations, installing sealed foundation drains, and backfilling with suitable coarse textured material help prevent structural damage caused by shrinking and swelling. The slow permeability restricts the absorption of effluent in the septic tank absorption fields. It can be overcome by

enlarging the field. The slope is a limitation on sites for sewage lagoons. If the less sloping areas are selected as sites for lagoons, less leveling and banking will be needed during construction.

7031—Eudora silt loam, occasionally flooded

This very deep, nearly level, well drained soil is on flood plains. Individual areas are irregular in shape and range from 10 to several hundred acres in size.

Map Unit Composition

Eudora: 87 percent
Minor components: 13 percent

Component Descriptions

Eudora

Landform: Flood plains in river valleys
Parent material: Loamy alluvium
Slope: 0 to 2 percent
Drainage class: Well drained
Slowest permeability: Moderate (about 0.60 inches per hour)
Available water capacity: Very high (about 12.1 inches)
Shrink-swell potential: Low (about 2.4 LEP)
Flooding frequency: Occasional
Ponding hazard: None
Depth to seasonal zone of saturation: More than 6 feet
Surface runoff class: Low
Ecological site: Loamy Lowland (pe30-36)
Land capability (nonirrigated): 2w

Typical profile:
Ap—0 to 7 inches; silt loam
A1—7 to 14 inches; silt loam
A2—14 to 19 inches; silt loam
C1—19 to 26 inches; silt loam
C2—26 to 60 inches; very fine sandy loam

Component note: Included with this soil in mapping are a few small areas of McCook and Sarpy soils. The McCook soils are calcareous at or near the surface. The sandy, excessively drained Sarpy soils are on small mounds. Also included in mapping are areas that have fine sand or loamy fine sand deposited by the flood of 1951. This deposit varies in thickness from 12 to about 36 inches. Some areas have been deep-plowed in an effort to reclaim them and have further altered the material.

Minor components

McCook
Extent: About 10 percent of the unit
Landform: Flood plains in river valleys
Slope: 0 to 1 percent
Drainage class: Well drained
Ecological site: Loamy Lowland (pe25-34)

Sarpy
Extent: About 3 percent of the unit

Landform: Flood plains in river valleys
Slope: 0 to 4 percent
Drainage class: Excessively drained
Ecological site: Sandy Lowland (pe30-36)

General Considerations

Nearly all of the acreage is used for cultivated crops. This soil is well suited to wheat, grain sorghum, and alfalfa. Flooding and soil blowing are hazards if cultivated crops are grown. Flooding delays planting and harvesting and damages crops in some years, but in other years the extra moisture may increase crop yields. Overcoming the hazard of flooding is difficult without major flood-control measures. A system of conservation tillage that leaves all or part of the crop residue on the surface improves fertility and tilth and increases the rate of water infiltration.

This soil is generally unsuited to dwellings because of the hazard of flooding. Dikes, levees, and other structures lessen this hazard.

This soil is generally unsuited to septic tank absorption fields and sewage lagoons. The flooding is a hazard affecting septic tank systems. Levees reduce this hazard. Seepage is a limitation affecting sewage lagoons. It can be controlled by sealing the lagoon.

7081—Sarpy loamy fine sand, 0 to 4 percent slopes

This very deep, undulating, excessively drained soil is on flood plains. Individual areas are irregular in shape and range from 20 to 160 acres in size.

Map Unit Composition

Sarpy: 90 percent
Minor components: 10 percent

Component Descriptions

Sarpy

Landform: Flood plains in river valleys
Parent material: Sandy alluvium
Slope: 0 to 4 percent
Drainage class: Excessively drained
Slowest permeability: Rapid (about 5.95 inches per hour)
Available water capacity: Low (about 4.5 inches)
Shrink-swell potential: Low (about 0.0 LEP)
Flooding frequency: Occasional
Ponding hazard: None
Depth to seasonal zone of saturation: More than 6 feet
Surface runoff class: Negligible
Ecological site: Sandy Lowland (pe30-36)
Land capability (nonirrigated): 4s

Typical profile:
Ap—0 to 9 inches; loamy fine sand
C—9 to 60 inches; fine sand

Component note: Included with this soil in mapping are small areas of the silty Eudora soils. Eudora soils are on nearly level, slightly lower areas.

Minor components

Eudora
Extent: About 10 percent of the unit
Landform: Flood plains in river valleys

Slope: 0 to 2 percent
Drainage class: Well drained
Ecological site: Loamy Lowland (pe30-36)

General Considerations

Nearly all areas are used for range or wildlife habitat. The dominant native vegetation is little bluestem, big bluestem, and prairie sandreed. Overgrazed areas are dominated by annual weeds. Proper stocking rates, timely deferment of grazing, and uniform distribution of grazing help keep the range in good condition.

Some areas of this soil have been used as a source of sand. Land smoothing and range seeding are needed to restore productivity in areas around abandoned sand pits.

These soils are generally unsuitable for building site development because of the hazard of flooding and seepage. Seepage from lagoons and septic tank absorption fields can contaminate ground water. Overcoming these hazards are difficult without major flood-control measures.

7082—Sarpy gravelly loamy sand, occasionally flooded

This very deep, undulating, excessively drained soil is on flood plains. Individual areas are irregular in shape and range from 20 to 80 acres in size.

Map Unit Composition

Sarpy: 90 percent
Minor components: 10 percent

Component Descriptions

Sarpy

Landform: Flood plains in river valleys
Parent material: Sandy alluvium
Slope: 0 to 4 percent
Drainage class: Excessively drained
Slowest permeability: Rapid (about 5.95 inches per hour)
Available water capacity: Very low (about 2.1 inches)
Shrink-swell potential: Low (0.0 LEP)
Flooding frequency: Occasional
Ponding hazard: None
Depth to seasonal zone of saturation: More than 6 feet
Surface runoff class: Negligible
Ecological site: Sandy Lowland (pe30-36)
Land capability (nonirrigated): 6s

Typical profile:
A—0 to 4 inches; gravelly loamy coarse sand
C1—4 to 10 inches; sand
C2—10 to 60 inches; coarse sand

Component note: Included with this soil in mapping are small areas of Eudora soils. The well drained, silty Eudora soils are on nearly level, slightly lower areas.

Minor components

Eudora
Extent: About 10 percent of the unit
Landform: Flood plains in river valleys
Slope: 0 to 2 percent

Drainage class: Well drained
Ecological site: Loamy Lowland (pe30-36)

General Considerations

Some areas of this soil have been used as a source of sand. Land smoothing and range seeding are needed to restore productivity in areas around abandoned sand pits.

This soil is generally unsuited for building site development because of the hazard of flooding. Seepage from lagoons and septic tank absorption fields can contaminate ground water. Overcoming these hazards are difficult without major flood-control measures.

7170—Reading silt loam, rarely flooded

This very deep, nearly level, well drained soil is on high flood plains. It is subject to rare flooding. Individual areas are irregular in shape and range from 5 to 30 acres in size.

Map Unit Composition

Reading: 85 percent
Minor components: 15 percent

Component Descriptions

Reading

Landform: Stream terraces in valleys
Parent material: Silty alluvium
Slope: 0 to 1 percent
Drainage class: Well drained
Slowest permeability: Moderately slow (about 0.20 inch per hour)
Available water capacity: High (about 11.8 inches)
Shrink-swell potential: Moderate (about 5.1 LEP)
Flooding frequency: Rare
Ponding hazard: None
Depth to seasonal zone of saturation: More than 6 feet
Surface runoff class: Low
Ecological site: Loamy Lowland (pe30-36)
Land capability (nonirrigated): 1

Typical profile:
Ap—0 to 8 inches; silt loam
A—8 to 20 inches; silty clay loam
Bt1—20 to 52 inches; silty clay loam
Bt2—52 to 60 inches; silty clay loam

Component note: Included with this soil in mapping are small areas of Kahola and Tully soils. The Kahola soils are silty and are adjacent to the stream channel. The Tully soils contain more clay in the subsoil and are on more sloping areas in the adjoining uplands. Also included in some areas are short, sloping escarpments to the adjoining lower flood plain.

Minor components

Tully
Extent: About 10 percent of the unit
Landform: Hillslopes on uplands
Slope: 1 to 4 percent
Drainage class: Well drained

Ecological site: Loamy Upland (pe30-36)

Kahola
Extent: About 5 percent of the unit
Landform: Flood plains on meander belts
Slope: 0 to 2 percent
Drainage class: Well drained
Ecological site: Loamy Lowland (pe30-36)

General Considerations

Nearly all acreage is used for cultivated crops. This soil is well suited to wheat, grain sorghum, soybeans, and alfalfa. The main management concern is maintenance of fertility and tilth. Applying a system of conservation tillage that leaves all or part of the crop residue on the surface improves fertility and tilth and increases the rate of water infiltration. Crop rotations help to control weeds, plant diseases, and insects.

Grain sorghum, soybeans, and corn are the main irrigated crops. Using water efficiently and maintaining soil fertility are management concerns. Controlling the rate of water application helps to conserve irrigation water and lowers the cost of operation.

This soil is poorly suited to dwellings because of the hazard of flooding. Dikes, levees, and other structures can reduce this hazard. Onsite inspection and knowledge of the flooding history of the area are needed when building sites are selected. This soil is poorly suited to septic tank absorption fields because of moderately slow permeability in the subsoil. Moderately slow permeability restricts the absorption of effluent in septic tank absorption fields. It can be overcome by enlarging the field. This soil is moderately well suited to sewage lagoons because of seepage. Sealing the lagoon can help to control seepage.

7173—Reading silty clay loam, rarely flooded

This very deep, nearly level, well drained soil is on high flood plains. It is subject to rare flooding. Individual areas are irregular in shape and range from 30 to 500 acres in size.

Map Unit Composition

Reading: 85 percent
Minor components: 15 percent

Component Descriptions

Reading

Landform: Stream terraces in valleys
Parent material: Silty alluvium
Slope: 0 to 1 percent
Drainage class: Well drained
Slowest permeability: Moderately slow (about 0.20 inch per hour)
Available water capacity: High (about 11.7 inches)
Shrink-swell potential: Moderate (about 5.1 LEP)
Flooding frequency: Rare
Ponding hazard: None
Depth to seasonal zone of saturation: More than 6 feet
Surface runoff class: Low
Ecological site: Loamy Lowland (pe30-36)
Land capability (nonirrigated): 1

Typical profile:
Ap—0 to 8 inches; silty clay loam
A—8 to 20 inches; silty clay loam
Bt1—20 to 52 inches; silty clay loam
Bt2—52 to 60 inches; silty clay loam

Component note: Included with this soil in mapping are small areas of Kahola and Tully soils. The Kahola soils are silty and are adjacent to stream channels. The Tully soils contain more clay in the subsoil and are on more sloping areas on the adjoining uplands. Also included in some areas are short, sloping escarpments to the adjoining lower flood plain. Included soils make up about 15 percent of the map unit.

Minor components

Tully
Extent: About 10 percent of the unit
Landform: Hillslopes on uplands
Slope: 1 to 4 percent
Drainage class: Well drained
Ecological site: Loamy Upland (pe30-36)

Kahola
Extent: About 5 percent of the unit
Landform: Flood plains on meander belts
Slope: 0 to 2 percent
Drainage class: Well drained
Ecological site: Loamy Lowland (pe30-36)

General Considerations

Nearly all acreage is used for cultivated crops. This soil is well suited to wheat, grain sorghum, soybeans, and alfalfa. The main management concern is maintenance of fertility and tilth. Applying a system of conservation tillage that leaves all or part of the crop residue on the surface improves fertility and tilth and increases the rate of water infiltration. Crop rotations help to control weeds, plant diseases, and insects.

Grain sorghum, soybeans, and corn are the main irrigated crops. Using water efficiently and maintaining soil fertility are management concerns. Controlling the rate of water application helps to conserve irrigation water and lowers the cost of operation.

This soil is poorly suited to dwellings because of the hazard of flooding. Dikes, levees, and other structures can reduce this hazard. Onsite inspection and knowledge of the flooding history of the area are needed when building sites are selected. This soil is poorly suited to septic tank absorption fields because the moderately slow permeability of the subsoil restricts the absorption of effluent. It can be overcome by enlarging the field. This soil is moderately well suited to sewage lagoons because of seepage. Sealing the lagoon can help to control seepage.

7740—Haynie silt loam, frequently flooded

This very deep, nearly level, well drained soil is on low flood plains. It is commonly adjacent to the major rivers in the county. Individual areas are generally in the shape of a half-moon on the inside of river channel meanders and range from 5 to 80 acres in size. Some areas are long and narrow ranging from 200 to 400 feet wide and 200 to 800 feet long.

Map Unit Composition

Haynie: 55 percent

Minor components: 45 percent

Component Descriptions

Haynie

Landform: Flood plains in river valleys
Parent material: Coarse-silty alluvium
Slope: 0 to 2 percent
Drainage class: Well drained
Slowest permeability: Moderate (about 0.60 inch per hour)
Available water capacity: Very high (about 12.4 inches)
Shrink-swell potential: Low (about 2.6 LEP)
Flooding frequency: Frequent
Ponding hazard: None
Depth to seasonal zone of saturation: More than 6 feet
Surface runoff class: Low
Ecological site: Loamy Lowland (pe30-36)
Land capability (nonirrigated): 5w

Typical profile:
A—0 to 10 inches; stratified silt loam
C—10 to 60 inches; stratified silt loam

Component note: Included with this soil in mapping are soils that are silt loam to a depth of about 36 inches and are silty clay loam or silty clay from 36 to 60 inches. Also included are soils that have strata of silty clay loam or silty clay 4 to 12 inches thick below 12 inches. Near the river channel are inclusions of sandy deposits from recent floods. These deposits generally do not support vegetation and have a water table at shallow depths. These included soils make up about 45 percent of the map unit.

General Considerations

Nearly all of the acreage is used as wildlife habitat. These soils are generally unsuited to cultivated crops because of the hazard of flooding. The vegetation is mostly cottonwood and hackberry and an understory of mid and tall grasses. This vegetation and the cultivated crops in nearby areas of arable soils provide habitat for many wildlife species, including deer, rabbits, squirrels, turkeys, and numerous songbirds. The adjacent river channels provide habitat for many wetland wildlife species including ducks and geese.

This soil is well suited to timber and firewood production. Competition from less desirable trees or shrubs is the main concern for management. Trees best suited for planting are eastern cottonwood, green ash, and black walnut.

These soils are generally unsuitable for building site development because of the flooding. Overcoming this hazard is difficult without major flood-control measures.

9971—Arents, earthen dam

Component Description

Arents, earthen dam, consist of areas where soil material was deposited to construct Milford Dam. The soil material is a mix of loamy and clayey material transported to the site from the reservoir area and compacted during construction of the Milford Lake.

9983—Gravel pits and quarries

Component Descriptions

Pits are open excavations from which soil and commonly underlying material have been removed, exposing either rock or other material. Kinds include Pits, mine; Pits, gravel; and Pits, quarry. Commonly, pits are closely associated with Dumps.

9986—Miscellaneous water

Component Description

Miscellaneous water includes small manmade water areas used for industrial, sanitary, or mining applications that contain water most of the year.

9988—Orthents

Component Description

Orthents consist of areas from which the soil and much of the underlying gravel, sand, and limestone or shale have been removed. The exposed areas of limestone or shale range from 3 to 30 acres in size and have nearly vertical walls 10 to 30 feet high. They support few plants. Soil material in long, narrow pits along highways has been removed for use in highway construction. These pits support some grasses and trees and are frequently ponded.

This map unit is generally unsuited to cultivation and to most other uses. In areas where surface drainage is good, it can be planted to trees and grasses. If vegetation is reestablished, these areas are well suited to wildlife habitat. Planting woody species improves the diversity of the vegetation. More diverse vegetation commonly attracts additional wildlife species.

9999—Water

Component Description

Water includes streams, lakes, ponds, and estuaries. These areas are covered with water in most years, at least during the period that is warm enough for plants to grow. Many areas are covered with water throughout the year.

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help to prevent soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland and forestland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreational facilities; for agricultural waste management; and as wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Interpretive Ratings

The interpretive tables in this survey rate the soils in the survey area for various uses. Many of the tables identify the limitations that affect specified uses and indicate the severity of those limitations.

Rating Class Terms

Rating classes are expressed in the tables in terms that indicate the extent to which the soils are limited by all of the soil features that affect a specified use or in terms that indicate the suitability of the soils for the use. Thus, the tables may show limitation classes or suitability classes. Terms for the limitation classes are *not limited, somewhat limited,* and *very limited*. The suitability ratings are expressed as *well suited, moderately suited, poorly suited,* and *unsuited* or as *good, fair,* and *poor*.

Crops and Pasture

Jerry B. Lee, conservation agronomist, Natural Resources Conservation Service, helped prepare this section.

General management needed for crops and pasture is suggested in this section. The estimated yields of the main crops and pasture plants are listed, the system of land

capability classification used by the Natural Resources Conservation Service is explained, and prime farmland is described.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under the heading "Detailed Soil Map Units." Specific information can be obtained from the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

About 75,000 acres in Geary County, or 30 percent of the total acreage, is used for cultivated crops. During the period 1980 to 1990, wheat was grown on about 36 percent of the cropland; grain sorghum on 15 percent; soybeans on 7 percent; and alfalfa, tame hay, and other miscellaneous crops on 31 percent (Kansas State Board of Agriculture, 1989). About 11 percent of the cropland was summer fallowed. The acreage used for soybeans increased during this period compared to that of the previous 10-year period. The acreage of all other crops remained about the same.

Crop production can be increased on most farms by applying the latest technology. This soil survey can facilitate the application of such technology. The main concerns in managing the soils in Geary County for cultivated crops are controlling erosion, conserving or increasing the moisture supply in the soils, and maintaining fertility and tilth.

Water erosion is the major hazard on about 20 percent of the cropland. It occurs mainly on soils that have a slope of 2 percent or more. Examples are Crete, Geary, Holder, Konza, and Longford soils.

Loss of the surface layer through erosion is damaging for two reasons. First, productivity is reduced as the surface layer is lost and part of the subsoil is incorporated into the plow layer. Loss of the surface layer is especially damaging on soils that have a clayey subsoil such as Crete, Konza, and Ladysmith soils. Secondly, erosion pollutes streams with sediments, nutrients, and pesticides. Control of erosion minimizes the pollution of streams and improves the quality of water.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for forestland, or for engineering purposes.

In the capability system, soils are generally grouped at three levels—capability class, subclass, and unit.

Capability classes, the broadest groups, are designated by the numbers 1 through 8. The numbers indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class 1 soils have slight limitations that restrict their use.

Class 2 soils have moderate limitations that restrict the choice of plants or that require moderate conservation practices.

Class 3 soils have severe limitations that restrict the choice of plants or that require special conservation practices, or both.

Class 4 soils have very severe limitations that restrict the choice of plants or that require very careful management, or both.

Class 5 soils are subject to little or no erosion but have other limitations, impractical to remove, that restrict their use mainly to pasture, rangeland, forestland, or wildlife habitat.

Class 6 soils have severe limitations that make them generally unsuitable for cultivation and that restrict their use mainly to pasture, rangeland, forestland, or wildlife habitat.

Class 7 soils have very severe limitations that make them unsuitable for cultivation and that restrict their use mainly to grazing, forestland, or wildlife habitat.

Class 8 soils and miscellaneous areas have limitations that preclude commercial plant production and that restrict their use to recreational purposes, wildlife habitat, watershed, or esthetic purposes.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, 2e. The letter *e* shows that the main hazard is the risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c,* used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class 1 there are no subclasses because the soils of this class have few limitations. Class 5 contains only the subclasses indicated by *w, s,* or *c* because the soils in class 5 are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, forestland, wildlife habitat, or recreation.

Capability units are soil groups within a subclass. The soils in a capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, 2e-4 and 3e-6. These units are not given in all soil surveys.

The capability classification of map units in this survey area is given in table 5.

Yields per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. The land capability classification of map units in the survey area also is shown in the table.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations also are considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

For yields of irrigated crops, it is assumed that the irrigation system is adapted to the soils and to the crops grown, that good quality irrigation water is uniformly applied as needed, and that tillage is kept to a minimum.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the

Natural Resources Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

The *soil rating for plant growth* (SRPG) in table 6 is a relative rating of the capacity of a soil to produce a specific plant under a defined management system. The index is determined from yield data on a few benchmark soils and is used to calculate yields, the net returns from crops, land assessment values, and taxes and to perform risk analysis when land management decisions are made. Specific information on plants and yields can be obtained from the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

Prime Farmland

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the Nation's short- and long-range needs for food and fiber. Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. It could be cultivated land, pastureland, forestland, or other land, but it is not urban or built-up land or water areas. The soil qualities, growing season, and moisture supply are those needed for the soil to economically produce sustained high yields of crops when proper management, including water management, and acceptable farming methods are applied. In general, prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, an acceptable salt and sodium content, and few or no rocks. It is permeable to water and air. It is not excessively erodible or saturated with water for long periods, and it either is not frequently flooded during the growing season or is protected from flooding. Slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Natural Resources Conservation Service.

A recent trend in land use in some parts of the survey area has been the loss of some prime farmland to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and less productive and cannot be easily cultivated.

The map units in the survey area that are considered prime farmland are listed in table 7. This list does not constitute a recommendation for a particular land use. On some soils included in the list, measures that overcome a hazard or limitation, such as flooding, wetness, and droughtiness, are needed. Onsite evaluation is needed to determine whether or not the hazard or limitation has been overcome by corrective measures. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps. The soil qualities that affect use and management are described under the heading "Detailed Soil Map Units."

Rangeland

Michael S. Meurisse, range conservationist, Natural Resources Conservation Service, helped prepare this section.

About 113,000 acres in Geary County, or 44 percent of the total acreage, is rangeland. Most of the rangeland is too steep or too rocky for cultivation. Cow-calf operations are the dominant livestock users of the county's rangeland, but yearling stock or operations are also common.

Some livestock producers use cool-season pastures, principally bromegrass, to extend the grazing season. Grain sorghum crop residue is commonly used as a supplemental forage in cow-calf operations. During winter, protein concentrates are used to supplement low-quality, dormant forages. During most winters, hay is fed for short periods when native grass pastures are covered with snow.

Soils strongly influence the potential plant community in any given area within the county. The soils and climate of the county generally support a tallgrass prairie natural plant community, dominated by bluestems, Indiangrass, and switchgrass. However, some of the steep, shallow soils are only capable of supporting a mixture of plants that is similar to the mixed prairie of central Kansas.

Naturally occurring fires played a major role in development of these plant communities. In areas where fire has been excluded, productivity of the rangeland has been reduced by brush invasion. Controlled burning is used extensively as a management tool in Geary County to reduce brush invasion, improve grazing distribution, and to improve weight gain of yearling cattle.

While most of the rangeland in the county has been well managed, forage production has been reduced in some areas by overgrazing. Because of rough topography, portions of a pasture are often overgrazed, while other areas may be underused. Spring developments, ponds, proper location of salt, fencing, and controlled burning can help to improve grazing distribution. These measures help to maintain or improve range condition when combined with proper grazing use, timely deferment of grazing, planned grazing systems, brush management, and reseeding of marginal cropland or depleted rangeland.

In areas that have similar climate and topography, differences in the kind and amount of rangeland or forest understory vegetation are closely related to the kind of soil. Effective management is based on the relationship between the soils and vegetation and water.

Table 8 shows, for each soil that supports vegetation suitable for grazing, the ecological site; the total annual production of vegetation in favorable, normal, and unfavorable years; the characteristic vegetation; and the average percentage of each species. An explanation of the column headings in this table follows.

An *ecological site* is the product of all the environmental factors responsible for its development. It has characteristic soils that have developed over time throughout the soil development process; a characteristic hydrology, particularly infiltration and runoff, that has developed over time; and a characteristic plant community (kind and amount of vegetation). The hydrology of the site is influenced by development of the soil and plant community. The vegetation, soils, and hydrology are all interrelated. Each is influenced by the others and influences the development of the others. The plant community on an ecological site is typified by an association of species that differs from that of other ecological sites in the kind and/or proportion of species or in total production. Descriptions of ecological sites are provided in the Field Office Technical Guide, which is available in local offices of the Natural Resources Conservation Service.

Total dry-weight production is the amount of vegetation that can be expected to grow annually in a well managed area that is supporting the potential natural plant community. It includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaves, twigs, and fruits of woody plants. It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for favorable, normal, and unfavorable years. In a favorable year, the amount and distribution of precipitation and the temperatures make growing conditions substantially better than average. In a normal year, growing conditions are about average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture. Yields are adjusted to a common percent of air-dry moisture content.

Characteristic vegetation—the grasses, forbs, and shrubs that make up most of the potential natural plant community on each soil—is listed by common name. Under *maximum rangeland composition*, the expected percentage of the total annual production is given for each species making up the characteristic vegetation. The amount that can be used as forage depends on the kinds of grazing animals and on the grazing season.

Range management requires a knowledge of the kinds of soil and of the potential natural plant community. It also requires an evaluation of the present range similarity index and rangeland trend. Range similarity index is determined by comparing the present plant community with the potential natural plant community on a particular rangeland ecological site. The more closely the existing community resembles the potential community, the higher the range similarity index. Rangeland trend is defined as the direction of change in an existing plant community relative to the potential natural plant community. Further information about the range similarity index and rangeland trend is available on the Internet in chapter 4 of the "National Range and Pasture Handbook."

The objective in range management is to control grazing so that the plants growing on a site are about the same in kind and amount as the potential natural plant community for that site. Such management generally results in the optimum production of vegetation, control of undesirable brush species, conservation of water, and control of erosion. Sometimes, however, an area with a range similarity index somewhat below the potential meets grazing needs, provides wildlife habitat, and protects soil and water resources.

The soils in the survey area are assigned to the following ecological sites: Clay Lowland, Claypan, Clay Upland, Limy Upland, Loamy Lowland, Loamy Terrace, Loamy Upland, Sandy, Sandy Lowland, and Shallow Limy. These sites are described in the paragraphs that follow.

Clay Lowland ecological site. The soils in this ecological site are on flood plains and terraces and are occasionally flooded.

The potential native vegetation on this site is a tall grass prairie. Typically, the dominant grasses are prairie cordgrass, which makes up about 45 percent of the vegetation; big bluestem, 10 percent; Indiangrass, 5 percent; switchgrass, 10 percent; and eastern gamagrass, 5 percent. Other grasses and grasslike plants are tall dropseed, Canada wildrye, green muhly, Florida paspalum, scouringrush, and sedges. Forbs, such as American licorice, Illinois bundleflower, Maximilian sunflower, wholeleaf rosinweed, tall goldenrod, and Baldwin ironweed make up about 10 percent of the vegetation. Woody plants, such as green ash, hackberry, buckbrush, indigobush, and cottonwood may be present in small amounts on this site.

Because of the extra moisture and deeper rooted plants, this site is a preferred grazing area, especially during plant stress periods. Overgrazing reduces the production of big bluestem, prairie cordgrass, Indiangrass, switchgrass, and eastern gamagrass. The amount of palatable forbs, such as American licorice, Illinois bundleflower, and Maximilian sunflower, is also reduced. Tall dropseed, Baldwin ironweed, and buckbrush are the principal increasers.

Where overgrazing has continued for a few years, the site can often be returned to near its potential by management that includes proper grazing use and a scheduled deferment of grazing during the growing season. If the site has been overgrazed for a long period, recovery may be slow even when good management is applied. Under these conditions, tall dropseed, Kentucky bluegrass, Japanese brome, Baldwin ironweed, buckbrush, and giant ragweed dominate the understory. In the absence of fire, the woody overstory vegetation will dominate the site.

Clay Upland ecological site. The soils in this ecological site are on uplands.

The potential native vegetation on this site is a tall grass prairie. Typically, the dominant grasses are big bluestem, which makes up about 30 percent of the vegetation; little bluestem, 20 percent; switchgrass, 15 percent; Indiangrass, 15

percent; and tall dropseed, 5 percent. Other grasses are porcupinegrass, western wheatgrass, blue grama, buffalograss, prairie junegrass, purple lovegrass, Canada wildrye, sideoats grama, and rosette panicum. Sedges are also usually present in small amounts. Forbs, such as catclaw sensitivebrier, pitcher sage, compassplant, American licorice, Louisiana sagewort, Illinois bundleflower, slimflower scurfpea, dotted gayfeather, goldenrods, and western ragweed make up about 10 percent of the vegetation. Leadplant is common on this site, but generally in small amounts.

Initial overgrazing on this site generally reduces the production of big bluestem, Indiangrass, and little bluestem. Switchgrass is reduced if overgrazing occurs during the first half of the growing season. Tall dropseed is the major increaser with overgrazing. After periods of continued overgrazing, tall dropseed, sideoats grama, broomweed, western ragweed, buffalograss, and western wheatgrass become the dominant species. Remnants of the preferred grass species will tend to survive in a very reduced condition unless destructive grazing occurs.

When most of the taller species are removed from the site through grazing pressure and dry weather cycles, returning the site to its potential native vegetation is extremely difficult and may take several decades. Proper stocking rates, timely deferment of grazing, and uniform distribution of grazing help to keep the range in good condition. Where trees and brush have invaded, brush control is needed to improve forage production. Controlled burning in late spring helps to control woody plants. The proper use of chemical sprays and selective cutting also helps to control woody plants.

Claypan ecological site. The soils in this ecological site are on nearly level to gently sloping uplands.

The potential native vegetation on this site is mixed prairie. Typically, the dominant grasses are big bluestem, which makes up about 15 percent of the vegetation; little bluestem, 15 percent; sideoats grama, 15 percent; switchgrass, 15 percent; western wheatgrass, 10 percent; Indiangrass, 5 percent; and tall dropseed, 5 percent. Other grasses are blue grama, buffalograss, rosette panicum, and purple lovegrass. Rushes and sedges generally grow on this site. Forbs, such as dotted gayfeather, heath aster, slimflower scurfpea, Missouri goldenrod, western ragweed, and Louisiana sagewort, make up about 10 percent of the vegetation.

Overgrazing on this site generally reduces the production of big bluestem, little bluestem, Indiangrass, and switchgrass. Tall dropseed, western wheatgrass, and buffalograss are the primary increasers. In severely overused areas Japanese brome, prairie threeawn, windmillgrass, buffalograss, and broomweed become the dominant species.

This site is frequently overgrazed because of its accessibility and the influence of sodium on the vegetation. A system of grazing that includes a scheduled deferment of grazing during the growing season can help to restore this site if overgrazing has not been severe. The vegetation improves slowly, however, compared to other ecological sites in the county.

Limy Upland ecological site. The soils in this ecological site are on gently sloping to steep uplands.

The potential native vegetation on this site is tall grass prairie. Typically, the dominant grasses are big bluestem, which makes up about 35 percent of the vegetation; little bluestem, 20 percent; sideoats grama, 10 percent; Indiangrass, 5 percent; and switchgrass, 5 percent. Other grasses are blue grama, buffalograss, plains muhly, and hairy grama. Forbs, such as blacksamson, catclaw sensitivebrier, dotted gayfeather, heath aster, purple prairie-clover, prairie coneflower, Missouri evening primrose, manyflower scurfpea, and western ragweed, make up about 15 percent of the vegetation. Leadplant, ceanothus, prairie rose, roughleaf dogwood, smooth sumac, and aromatic sumac grow in small amounts.

In overgrazed areas big bluestem, little bluestem, Indiangrass, and switchgrass are the major decreasers. Sideoats grama, hairy grama, Missouri goldenrod, Louisiana

sagewort, heath aster, western ragweed, smooth sumac, and roughleaf dogwood are the principal increasers. In severely overgrazed areas blue grama, buffalograss, Japanese brome, Kentucky bluegrass, smooth sumac, roughleaf dogwood, buckbrush, osageorange, and eastern redcedar become the dominant vegetation.

In the steeper, less accessible areas, the preferred grass species generally are not excessively grazed. These areas help to provide seed sources for the better forage plants after long periods of drought or overgrazing, or both. Grazing distribution is a problem because the livestock prefer the more gently sloping areas. Measures that distribute the grazing evenly, proper stocking rates, prescribed burning, and a scheduled deferment of grazing during the growing season help to restore this site to its production potential. Properly located salting and watering facilities help to achieve an even distribution of grazing. Other management techniques, such as proper fence location and a planned grazing system, also are beneficial.

Where trees and brush have invaded, brush control is needed to improve forage production (fig. 6). Controlled burning in late spring helps to control woody plants. The proper use of chemical sprays and selective cutting also help to control woody plants.

Loamy Upland ecological site. The soils in this ecological site are on uplands.

The potential native vegetation on this site is tall grass prairie. Typically, the dominant grasses are big bluestem, which makes up about 35 percent of the vegetation; little bluestem, 20 percent; Indiangrass, 10 percent; switchgrass, 10 percent; and eastern gamagrass, 10 percent. Other grasses are prairie junegrass, sideoats grama, tall dropseed, Canada wildrye, blue grama, and Scribner panicum. Forbs, such as catclaw sensitivebrier, Illinois bundleflower, purple prairie-clover, dotted

Figure 6.—An area of Clime-Sogn complex, 3 to 20 percent slopes, where brush and trees have invaded. This unit is in the Limy Upland ecological site.

gayfeather, compassplant, heath aster, and pitcher sage, make up about 10 percent of the vegetation. Leadplant is common on this site but generally is in small amounts.

Initial overgrazing of this site generally reduces the production of big bluestem, Indiangrass, switchgrass, and preferred forbs. Under these conditions, little bluestem, sideoats grama, tall dropseed, buffalograss, blue grama, and western ragweed increase in abundance. After periods of continued overgrazing, tall dropseed, western ragweed, Kentucky bluegrass, buckbrush, and redcedar become the dominant species.

When most of the taller species are removed from the site through grazing pressure and dry weather cycles, returning the site to its potential native vegetation is extremely difficult. Where remnant stands of the taller species are evident, the site can be returned to its production potential by proper stocking rates and a system of grazing that includes a scheduled deferment of grazing during the growing season.

Loamy Lowland ecological site. The soils in this ecological site are on flood plains and terraces and are rarely or occasionally flooded.

The potential native vegetation on this site is tall grass prairie. Typically, the dominant grasses are big bluestem, which makes up about 40 percent of the vegetation; eastern gamagrass, 15 percent; Indiangrass, 10 percent; prairie cordgrass, 5 percent; and switchgrass, 10 percent. Other grasses are Florida paspalum, green muhly, tall dropseed, prairie junegrass, Canada wildrye, and knotroot bristlegrass. Forbs, such as American licorice, compassplant, Illinois bundleflower, Maximilian sunflower, sawtooth sunflower, Baldwin ironweed, Louisiana sagewort, and western ragweed, make up 10 percent of the vegetation. Black walnut, bur oak, hackberry, indigobush, and elderberry make up about 5 percent.

Because of the extra moisture and deeper rooted plants, this site is a preferred grazing area, especially during plant stress periods. Overgrazing reduces the production of big bluestem, eastern gamagrass, Indiangrass, and switchgrass. The amount of palatable forbs, such as American licorice, compassplant, Illinois bundleflower, and Maximilian sunflower is also reduced. Tall dropseed, Baldwin ironweed, western ragweed, and buckbrush are the principal increasers.

Where overgrazing has continued for a few years, the site can often be nearly returned to its potential by management that includes proper grazing use and a scheduled deferment of grazing during the growing season. If the site has been overgrazed for a long period, recovery may be slow even when good management is applied. Under these conditions, tall dropseed, western ragweed, and undesirable woody species become the dominant vegetation. If fire is excluded, this site often becomes dominated by tree species.

Loamy Terrace ecological site. The soils in this ecological site are on nearly level stream terraces and are subject to rare flooding.

The potential native vegetation on this site is tall grass prairie. Typically, the dominant grasses are big bluestem, which makes up about 35 percent of the vegetation; switchgrass, 10 percent; little bluestem, 10 percent; Indiangrass, 10 percent; western wheatgrass, 5 percent; and sideoats grama, 5 percent. Other grasses are Canada wildrye, blue grama, rosette panicum, tall dropseed, and western wheatgrass. Sedges are usually present in amounts up to 5 percent. Forbs, such as American licorice, aromatic aster, catclaw sensitivebrier, heath aster, Illinois bundleflower, Louisiana sagewort, pitcher sage, slimflower scurfpea, and western ragweed, make up about 5 percent of the vegetation. Small amounts of American plum and buckbrush are common.

This site is generally grazed along with larger areas of upland ecological sites. Because of the combination of sites, the careful use of management practices, such as fencing and the proper location of water, salt, minerals, and feeding areas, are needed to achieve an adequate distribution of grazing. After periods of continued excessive use, the amount of big bluestem, little bluestem, switchgrass, and eastern

gamagrass decreases. Long-term overgrazing may remove these species from the site. Western wheatgrass and sideoats grama are the major increasers on this site, along with forbs, blue grama, and tall dropseed.

Returning a continuously overgrazed area to its original productivity is difficult. In areas where remnant stands of the taller grasses are evident, proper stocking rates and periodic deferment of grazing or a planned grazing system help to nearly return the site to its potential. These practices also help to improve or maintain the site at any stage of productivity.

Sandy Lowland ecological site. The soils in this ecological site are occasionally flooded and are on flood plains adjacent to stream channels.

The potential native vegetation of this site is tall grass prairie and sparse to dense stands of bottom land timber. Typically, the dominant grasses are sand bluestem, which makes up about 30 percent of the vegetation; little bluestem, 15 percent; Indiangrass, 10 percent; switchgrass, 10 percent; and eastern gamagrass, 5 percent. Other grasses are prairie sandreed, Canada wildrye, sand lovegrass, porcupinegrass, western wheatgrass, purpletop, sand paspalum, and tall dropseed. Forbs such as catclaw sensitivebrier, woolly verbena, Illinois bundleflower, Maximilian sunflower, Louisiana sagewort, and western ragweed make up about 10 percent of the vegetation. Woody plants, such as cottonwood, hackberry, green ash, poison ivy, black willow, and American plum make up about 15 percent.

Initial overgrazing on this site reduces the production of the sand bluestem, Indiangrass, switchgrass, and eastern gamagrass. As the production of these species decreases, the amount of purpletop, sand paspalum, and others increases. If overgrazing continues, and fire is excluded, a large increase in the tree and shrub population is likely.

When most of the taller species are removed from the site through grazing pressure and dry weather cycles, restoring the potential native vegetation is difficult. Where remnants of the taller species are evident, management that includes proper stocking rates and a scheduled deferment of grazing during the growing season is effective in nearly restoring the site to its potential. When trees and shrubs dominate the site, it is nearly impossible to return the site to herbaceous vegetation without a complete clearing operation.

Sandy ecological site. The soils in this ecological site are on uplands.

The potential native vegetation on this site is mixed prairie grasses. Typically, the dominant grasses are sand bluestem, which makes up about 40 percent of the vegetation; little bluestem, 20 percent; switchgrass, 10 percent; Indiangrass, 5 percent; porcupinegrass, 5 percent, sideoats grama, 5 percent; and blue grama, 5 percent. Other grasses are Canada wildrye, sand dropseed, tall dropseed, hairy grama, windmillgrass, sand paspalum, and Scribner panicum. Forbs such as Louisiana sagewort, poppymallow, slimflower scurfpea, upright prairie coneflower, western ragweed, and yarrow make up about 5 percent of the vegetation. Chickasaw plum, prairie rose, small soapweed, and American plum make up about 5 percent.

This site generally is a highly preferred grazing area. Because of past grazing management, it is generally more deteriorated than most of the adjacent sites. Overgrazing rapidly reduces the production of big or sand bluestem. Sand bluestem is generally replaced by little bluestem, sideoats grama, blue grama, and sand dropseed. If overgrazing continues, the amount of little bluestem and switchgrass is reduced. After long periods of severe overgrazing, the site is dominated by sand dropseed, sand paspalum, annual grasses, unpalatable forbs, and woody species.

Management that includes proper grazing use and a scheduled deferment of grazing during the growing season maintains this site in a productive condition. Also, it can restore overgrazed areas to their original production potential if remnants of the original species are evident. Reseeding may be needed on sites where the more desirable mid and tall grasses have been removed.

Shallow Limy ecological site. The soils in this ecological site are on gently sloping to steep uplands.

The potential native vegetation on this site is mixed grass prairie. Typically, the dominant grasses are big bluestem, which makes up about 25 percent of the vegetation; little bluestem, 20 percent; sideoats grama, 20 percent; Indiangrass, 10 percent; and switchgrass, 5 percent. Other grasses are blue grama, hairy grama, green muhly, buffalograss, tall dropseed, and rosette panicum. Forbs such as blacksamson, catclaw sensitivebrier, dotted gayfeather, purple prairie-clover, Missouri evening primrose, nettleleaf noseburn, and western ragweed make up about 15 percent of the vegetation. Aromatic sumac, buckbrush, ceanothus, leadplant, pricklypear, and smooth sumac may make up about 5 percent of the vegetation on this site.

In overgrazed areas big bluestem, little bluestem, and Indiangrass are the major decreasers. Sideoats grama, blue grama, buffalograss, and hairy grama are principal increasers. In severely overgrazed areas hairy grama, annual grasses, unpalatable forbs, and smooth sumac become the dominant vegetation.

This site is often grazed more heavily than adjoining sites, especially in summer. Cattle prefer the shorter plant growth on this site, as well as the cooling summer winds which generally cross these areas. This site generally occurs in narrow bands across the slopes. If the adjoining sites have not been overgrazed, they provide a source of desirable plants to recolonize the site when management is improved. Grazing management that provides improved grazing distribution, proper stocking rates, and a scheduled deferment of grazing during the growing season helps to restore this site to its potential. Properly locating salting and watering facilities help to distribute grazing. Other management techniques, such as proper fence location, planned grazing systems, and prescribed burning are also beneficial.

Native Woodland, Windbreaks, and Environmental Plantings

Gary A. Kuhn, forester, Natural Resources Conservation Service, helped prepare this section.

Native woodland in Geary County occurs on the bottom land along rivers and streams, in upland drainageways, and on steep breaks. Approximately 18,600 acres, or 8 percent of the county, is considered forest land suitable for commercial production of wood products.

The most productive woodlands are found on deep well-drained loamy soils near the major rivers and streams. Soils in these areas are the Kahola, Eudora, Reading, and Haynie. Important trees on these soils include eastern cottonwood, hackberry, black walnut, green ash, honeylocust, basswood, bur oak, American sycamore, red (slippery) elm, American elm, boxelder, and silver maple. Flooding frequency on these soils affects woodland suitability and productivity. Kahola, Eudora, and Reading soils are flooded less frequently than the Haynie soil and can be managed for production of black walnut, bur oak, and hackberry. Eastern cottonwood and green ash are more common on the Haynie soils. Most of these soils are in crop production; however, the remaining stands of timber adjacent to cropland have good potential to produce quality wood products if some forest management practices are applied. Also, cropland acres on these soils provide excellent sites for timber, firewood, or Christmas tree plantings.

Sarpy soils are also found on bottom land next to rivers. These soils are sandy textured and drier than the loamy bottom land soils. Common trees found on these soils include eastern cottonwood, red elm, boxelder, green ash, American sycamore, basswood, hackberry, and honeylocust.

The Clime and Tully soils are on upland side slopes. The Clime soils occur on the steep side slopes in association with the Ft. Riley limestone. In wooded areas the vegetation consists mainly of poor quality chinkapin oak. The use and management of

this soil is best left for range, watershed protection, or wildlife habitat. The Tully soils occur on the lower footslopes along upland drainageways. Wooded areas have fair stands of bur oak, hackberry, and green ash. This soil has good potential for production of firewood and wildlife habitat with some limited timber harvesting possible.

Most farmsteads and ranch headquarters in Geary County are protected by windbreaks. Eastern redcedar and Siberian elm are the most common species in these windbreaks. Other species that occur include green ash, honeylocust, eastern cottonwood, hackberry, Scotch pine, Austrian pine, and ponderosa pine. Many windbreaks that are more than 30 years old need renovation.

In order for windbreaks to fulfill their intended purpose, the trees and shrubs selected for planting should be suited to the soils. Selecting suitable species helps to ensure survival and maximum growth rate. Permeability, available water capacity, fertility, soil depth, and soil texture greatly affect the growth rate.

Trees and shrubs generally can be easily established in Geary County. The survival rate can be reduced mainly by competition from weeds and grasses and by dry conditions. The main management needs are proper site preparation before the trees or shrubs are planted and measures that control competing vegetation after planting. Supplemental watering may be needed during dry periods.

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, help to keep snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To ensure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Table 9 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in the table are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Natural Resources Conservation Service or the Cooperative Extension Service or from a commercial nursery.

Recreation

Ken Kuiper, biologist, Natural Resources Conservation Service, helped prepare this section.

Geary County has several areas of scenic, geologic, and historic interest. These areas provide a variety of public outdoor recreation and educational opportunities.

The Fort Riley Limestone Formation is a massive rock layer that is responsible for the geologic development of the second largest remaining, contiguous native rangeland in the world called the Flint Hills. Travelers enjoy the rugged beauty of the region that is characterized by scenic, unbroken rangeland and clean, meandering streams.

Camping, fishing, boating, picnicking, swimming, and hunting are found on thousands of acres of lakes, streams, rivers, and public wildlife areas. Geary County State Lake and Milford Lake (fig. 7) are the two large public areas with a state fish hatchery and conservation education center located below Milford Dam.

The soils of the survey area are rated in table 10 according to limitations that affect their suitability for recreation. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect the recreational uses. *Not limited*

Figure 7.—An area of Holder silt loam, 3 to 7 percent slopes, near Milford Lake.

indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

The ratings in the tables are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation also are important. Soils that are subject to flooding are limited for recreational uses by the duration and intensity of flooding and the season when flooding occurs. In planning recreational facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

The information in table 10 can be supplemented by other information in this survey, for example, interpretations for building site development, construction materials, sanitary facilities, and water management.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The ratings are based on the soil properties that affect the ease of developing camp areas and the performance of the areas after development. Slope,

stoniness, and depth to bedrock or a cemented pan are the main concerns affecting the development of camp areas. The soil properties that affect the performance of the areas after development are those that influence trafficability and promote the growth of vegetation, especially in heavily used areas. For good trafficability, the surface of camp areas should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry. The soil properties that influence trafficability are texture of the surface layer, depth to a water table, ponding, flooding, permeability, and large stones. The soil properties that affect the growth of plants are depth to bedrock or a cemented pan, permeability, and toxic substances in the soil.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The ratings are based on the soil properties that affect the ease of developing picnic areas and that influence trafficability and the growth of vegetation after development. Slope and stoniness are the main concerns affecting the development of picnic areas. For good trafficability, the surface of picnic areas should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry. The soil properties that influence trafficability are texture of the surface layer, depth to a water table, ponding, flooding, permeability, and large stones. The soil properties that affect the growth of plants are depth to bedrock or a cemented pan, permeability, and toxic substances in the soil.

Playgrounds require soils that are nearly level, are free of stones, and can withstand intensive foot traffic. The ratings are based on the soil properties that affect the ease of developing playgrounds and that influence trafficability and the growth of vegetation after development. Slope and stoniness are the main concerns affecting the development of playgrounds. For good trafficability, the surface of the playgrounds should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry. The soil properties that influence trafficability are texture of the surface layer, depth to a water table, ponding, flooding, permeability, and large stones. The soil properties that affect the growth of plants are depth to bedrock or a cemented pan, permeability, and toxic substances in the soil.

Paths and trails for hiking and horseback riding should require little or no slope modification through cutting and filling. The ratings are based on the soil properties that affect trafficability and erodibility. These properties are stoniness, depth to a water table, ponding, flooding, slope, and texture of the surface layer.

Off-road motorcycle trails require little or no site preparation. They are not covered with surfacing material or vegetation. Considerable compaction of the soil material is likely. The ratings are based on the soil properties that influence erodibility, trafficability, dustiness, and the ease of revegetation. These properties are stoniness, slope, depth to a water table, ponding, flooding, and texture of the surface layer.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. Irrigation is not considered in the ratings. The ratings are based on the soil properties that affect plant growth and trafficability after vegetation is established. The properties that affect plant growth are reaction; depth to a water table; ponding; depth to bedrock or a cemented pan; the available water capacity in the upper 40 inches; the content of salts, sodium, or calcium carbonate; and sulfidic materials. The properties that affect trafficability are flooding, depth to a water table, ponding, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer. The suitability of the soil for traps, tees, roughs, and greens is not considered in the ratings.

Wildlife Habitat

Ken Kuiper, biologist, Natural Resources Conservation Service, helped prepare this section.

The Geary County ecosystem supports both terrestrial and aquatic game and nongame fish and wildlife. These species depend on a diversity of suitable habitat that

is part of the natural environment. Each population survives on habitat elements that include soil, water, and plants. This section provides basic soil information related to planning, applying, and maintaining habitat for wildlife.

Big game species provide unique hunting opportunities for sportsmen. Turkey and deer found throughout the area are closely associated with riparian habitat. Fort Riley Military Reservation contains a resident population of elk that is presently one of two hunted herds in Kansas.

Small game species include bobwhite quail, ring-necked pheasant, cottontail rabbit, prairie chicken, and fox squirrel. Migratory game birds that periodically use the county are dove, geese, and ducks. Interest in furbearers is influenced by international supply and demand. Species include raccoon, coyote, opossum, beaver, muskrat, mink, and striped skunk.

Nongame species are important to the public and wildlife-oriented organizations. The bald eagle and other raptors, song birds, shore birds, reptiles, amphibians, and fish are watched, studied, and collected. Species considered threatened and endangered are protected by state and federal statutes. Critical habitat for threatened and endangered species is also protected by statute.

Milford Reservoir and numerous small lakes provide water-based recreation as well as water supply. Largemouth bass, walleye, white bass, bluegill, crappie, and catfish are commonly caught by anglers.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 11, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flooding. Soil temperature and soil moisture also are considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flooding, and slope. Soil temperature and soil moisture also are considerations. Examples of grasses and legumes are fescue, lovegrass, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flooding. Soil temperature and soil moisture also are considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, wheatgrass, and grama.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of these plants are oak, poplar, cherry, sweetgum, apple, hawthorn, dogwood, hickory, blackberry, and blueberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are Russian-olive, autumn-olive, and crabapple.

Coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, cedar, and juniper.

Shrubs are bushy woody plants that produce fruit, buds, twigs, bark, and foliage. Soil properties and features that affect the growth of shrubs are depth of the root zone, available water capacity, salinity, and soil moisture. Examples of shrubs are mountainmahogany, bitterbrush, snowberry, and big sagebrush.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, wildrice, saltgrass, cordgrass, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. Wildlife attracted to these areas include bobwhite quail, pheasant, meadowlark, field sparrow, cottontail, and red fox.

Habitat for woodland wildlife consists of areas of deciduous and/or coniferous plants and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, deer, and bear.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, and beaver.

Habitat for rangeland wildlife consists of areas of shrubs and wild herbaceous plants. Wildlife attracted to rangeland include antelope, deer, sage grouse, meadowlark, and lark bunting.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. Ratings are given for building site development, sanitary facilities, construction materials, and water management. The ratings are based on

observed performance of the soils and on the data in the tables described under the heading “Soil Properties.”

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil between the surface and a depth of 5 to 7 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about particle-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 7 feet of the surface, soil wetness, depth to a water table, ponding, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kinds of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Soil properties influence the development of building sites, including the selection of the site, the design of the structure, construction, performance after construction, and maintenance. Table12 shows the degree and kind of soil limitations that affect dwellings with and without basements, small commercial buildings, local roads and streets, shallow excavations, and lawns and landscaping.

Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect building site development. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more

features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Dwellings are single-family houses of three stories or less. For dwellings without basements, the foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of 2 feet or at the depth of maximum frost penetration, whichever is deeper. For dwellings with basements, the foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of about 7 feet. The ratings for dwellings are based on the soil properties that affect the capacity of the soil to support a load without movement and on the properties that affect excavation and construction costs. The properties that affect the load-supporting capacity include depth to a water table, ponding, flooding, subsidence, linear extensibility (shrink-swell potential), and compressibility. Compressibility is inferred from the Unified classification. The properties that affect the ease and amount of excavation include depth to a water table, ponding, flooding, slope, depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, and the amount and size of rock fragments.

Small commercial buildings are structures that are less than three stories high and do not have basements. The foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of 2 feet or at the depth of maximum frost penetration, whichever is deeper. The ratings are based on the soil properties that affect the capacity of the soil to support a load without movement and on the properties that affect excavation and construction costs. The properties that affect the load-supporting capacity include depth to a water table, ponding, flooding, subsidence, linear extensibility (shrink-swell potential), and compressibility (which is inferred from the Unified classification). The properties that affect the ease and amount of excavation include flooding, depth to a water table, ponding, slope, depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, and the amount and size of rock fragments.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or soil material stabilized by lime or cement; and a surface of flexible material (asphalt), rigid material (concrete), or gravel with a binder. The ratings are based on the soil properties that affect the ease of excavation and grading and the traffic-supporting capacity. The properties that affect the ease of excavation and grading are depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, depth to a water table, ponding, flooding, the amount of large stones, and slope. The properties that affect the traffic-supporting capacity are soil strength (as inferred from the AASHTO group index number), subsidence, linear extensibility (shrink-swell potential), the potential for frost action, depth to a water table, and ponding.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for graves, utility lines, open ditches, or other purposes. The ratings are based on the soil properties that influence the ease of digging and the resistance to sloughing. Depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, the amount of large stones, and dense layers influence the ease of digging, filling, and compacting. Depth to the seasonal high water table, flooding, and ponding may restrict the period when excavations can be made. Slope influences the ease of using machinery. Soil texture, depth to the water table, and linear extensibility (shrink-swell potential) influence the resistance to sloughing.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. Irrigation is not considered in the ratings. The ratings are based on the soil properties that affect plant growth and trafficability after vegetation is established. The properties that affect plant growth are reaction; depth to a water table; ponding; depth to bedrock or a cemented pan; the available water capacity in the upper 40 inches; the content of salts, sodium, or calcium carbonate;

and sulfidic materials. The properties that affect trafficability are flooding, depth to a water table, ponding, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer.

Sanitary Facilities

Table 13 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, sanitary landfills, and daily cover for landfill. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect these uses. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 60 inches is evaluated. The ratings are based on the soil properties that affect absorption of the effluent, construction and maintenance of the system, and public health. Permeability, depth to a water table, ponding, depth to bedrock or a cemented pan, and flooding affect absorption of the effluent. Stones and boulders, ice, and bedrock or a cemented pan interfere with installation. Subsidence interferes with installation and maintenance. Excessive slope may cause lateral seepage and surfacing of the effluent in downslope areas.

Some soils are underlain by loose sand and gravel or fractured bedrock at a depth of less than 4 feet below the distribution lines. In these soils the absorption field may not adequately filter the effluent, particularly when the system is new. As a result, the ground water may become contaminated.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water. Considered in the ratings are slope, permeability, depth to a water table, ponding, depth to bedrock or a cemented pan, flooding, large stones, and content of organic matter.

Soil permeability is a critical property affecting the suitability for sewage lagoons. Most porous soils eventually become sealed when they are used as sites for sewage lagoons. Until sealing occurs, however, the hazard of pollution is severe. Soils that have a permeability rate of more than 2 inches per hour are too porous for the proper functioning of sewage lagoons. In these soils, seepage of the effluent can result in contamination of the ground water. Ground-water contamination is also a hazard if fractured bedrock is within a depth of 40 inches, if the water table is high enough to raise the level of sewage in the lagoon, or if floodwater overtops the lagoon.

A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor. If the lagoon is to be uniformly deep throughout, the slope must be gentle enough and the soil material must be thick enough over bedrock or a cemented pan to make land smoothing practical.

A *trench sanitary landfill* is an area where solid waste is placed in successive layers in an excavated trench. The waste is spread, compacted, and covered daily with a thin

layer of soil excavated at the site. When the trench is full, a final cover of soil material at least 2 feet thick is placed over the landfill. The ratings in the table are based on the soil properties that affect the risk of pollution, the ease of excavation, trafficability, and revegetation. These properties include permeability, depth to bedrock or a cemented pan, depth to a water table, ponding, slope, flooding, texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, onsite investigation may be needed.

Hard, nonrippable bedrock, creviced bedrock, or highly permeable strata in or directly below the proposed trench bottom can affect the ease of excavation and the hazard of ground-water pollution. Slope affects construction of the trenches and the movement of surface water around the landfill. It also affects the construction and performance of roads in areas of the landfill.

Soil texture and consistence affect the ease with which the trench is dug and the ease with which the soil can be used as daily or final cover. They determine the workability of the soil when dry and when wet. Soils that are plastic and sticky when wet are difficult to excavate, grade, or compact and are difficult to place as a uniformly thick cover over a layer of refuse.

The soil material used as the final cover for a trench landfill should be suitable for plants. It should not have excess sodium or salts and should not be too acid. The surface layer generally has the best workability, the highest content of organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

In an *area sanitary landfill*, solid waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site. A final cover of soil material at least 2 feet thick is placed over the completed landfill. The ratings in the table are based on the soil properties that affect trafficability and the risk of pollution. These properties include flooding, permeability, depth to a water table, ponding, slope, and depth to bedrock or a cemented pan.

Flooding is a serious problem because it can result in pollution in areas downstream from the landfill. If permeability is too rapid or if fractured bedrock, a fractured cemented pan, or the water table is close to the surface, the leachate can contaminate the water supply. Slope is a consideration because of the extra grading required to maintain roads in the steeper areas of the landfill. Also, leachate may flow along the surface of the soils in the steeper areas and cause difficult seepage problems.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste. The ratings in the table also apply to the final cover for a landfill. They are based on the soil properties that affect workability, the ease of digging, and the ease of moving and spreading the material over the refuse daily during wet and dry periods. These properties include soil texture, depth to a water table, ponding, rock fragments, slope, depth to bedrock or a cemented pan, reaction, and content of salts, sodium, or lime.

Loamy or silty soils that are free of large stones and excess gravel are the best cover for a landfill. Clayey soils may be sticky and difficult to spread; sandy soils are subject to wind erosion.

Slope affects the ease of excavation and of moving the cover material. Also, it can influence runoff, erosion, and reclamation of the borrow area.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as the final cover for a landfill should be suitable for plants. It should not have excess sodium, salts, or lime and should not be too acid.

Agricultural Waste Management

Soil properties are important considerations in areas where soils are used as sites for the treatment and disposal of organic waste and wastewater. Selection of soils with properties that favor waste management can help to prevent environmental damage.

Table 14 shows the degree and kind of soil limitations affecting the treatment of agricultural waste, including municipal and food-processing wastewater and effluent from lagoons or storage ponds. Municipal wastewater is the waste stream from a municipality. It contains domestic waste and may contain industrial waste. It may have received primary or secondary treatment. It is rarely untreated sewage. Food-processing wastewater results from the preparation of fruits, vegetables, milk, cheese, and meats for public consumption. In places it is high in content of sodium and chloride. In the context of these tables, the effluent in lagoons and storage ponds is from facilities used to treat or store food-processing wastewater or domestic or animal waste. Domestic and food-processing wastewater is very dilute, and the effluent from the facilities that treat or store it commonly is very low in content of carbonaceous and nitrogenous material; the content of nitrogen commonly ranges from 10 to 30 milligrams per liter. The wastewater from animal waste treatment lagoons or storage ponds, however, has much higher concentrations of these materials, mainly because the manure has not been diluted as much as the domestic waste. The content of nitrogen in this wastewater generally ranges from 50 to 2,000 milligrams per liter. When wastewater is applied, checks should be made to ensure that nitrogen, heavy metals, and salts are not added in excessive amounts.

The ratings in the tables are for waste management systems that not only dispose of and treat organic waste or wastewater but also are beneficial to crops (application of manure and food-processing waste, application of sewage sludge, and disposal of wastewater by irrigation) and for waste management systems that are designed only for the purpose of wastewater disposal and treatment (overland flow of wastewater, rapid infiltration of wastewater, and slow rate treatment of wastewater).

Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect agricultural waste management. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Application of manure and food-processing waste not only disposes of waste material but also can improve crop production by increasing the supply of nutrients in the soils where the material is applied. Manure is the excrement of livestock and poultry, and food-processing waste is damaged fruit and vegetables and the peelings, stems, leaves, pits, and soil particles removed in food preparation. The manure and food-processing waste are either solid, slurry, or liquid. Their nitrogen content varies. A high content of nitrogen limits the application rate. Toxic or otherwise dangerous wastes, such as those mixed with the lye used in food processing, are not considered in the ratings. The ratings are based on the soil properties that affect absorption, plant growth, microbial activity, erodibility, the rate at which the waste is applied, and the method by which the waste is applied. The properties that affect absorption include permeability, depth to a water table, ponding, the sodium adsorption ratio, depth to bedrock or a cemented pan, and available water capacity. The properties that affect plant growth and microbial activity include reaction, the sodium adsorption ratio,

salinity, and bulk density. The wind erodibility group, the soil erodibility factor K, and slope are considered in estimating the likelihood that wind erosion or water erosion will transport the waste material from the application site. Stones, cobbles, a water table, ponding, and flooding can hinder the application of waste. Permanently frozen soils are unsuitable for waste treatment.

Application of sewage sludge not only disposes of waste material but also can improve crop production by increasing the supply of nutrients in the soils where the material is applied. In the context of this table, sewage sludge is the residual product of the treatment of municipal sewage. The solid component consists mainly of cell mass, primarily bacteria cells that developed during secondary treatment and have incorporated soluble organics into their own bodies. The sludge has small amounts of sand, silt, and other solid debris. The content of nitrogen varies. Some sludge has constituents that are toxic to plants or hazardous to the food chain, such as heavy metals and exotic organic compounds, and should be analyzed chemically prior to use.

The content of water in the sludge ranges from about 98 percent to less than 40 percent. The sludge is considered liquid if it is more than about 90 percent water, slurry if it is about 50 to 90 percent water, and solid if it is less than about 50 percent water.

The ratings in the table are based on the soil properties that affect absorption, plant growth, microbial activity, erodibility, the rate at which the sludge is applied, and the method by which the sludge is applied. The properties that affect absorption, plant growth, and microbial activity include permeability, depth to a water table, ponding, the sodium adsorption ratio, depth to bedrock or a cemented pan, available water capacity, reaction, salinity, and bulk density. The wind erodibility group, the soil erodibility factor K, and slope are considered in estimating the likelihood that wind erosion or water erosion will transport the waste material from the application site. Stones, cobbles, a water table, ponding, and flooding can hinder the application of sludge. Permanently frozen soils are unsuitable for waste treatment.

Disposal of wastewater by irrigation not only disposes of municipal wastewater and wastewater from food-processing plants, lagoons, and storage ponds but also can improve crop production by increasing the amount of water available to crops. The ratings in the table are based on the soil properties that affect the design, construction, management, and performance of the irrigation system. The properties that affect design and management include the sodium adsorption ratio, depth to a water table, ponding, available water capacity, permeability, slope, and flooding. The properties that affect construction include stones, cobbles, depth to bedrock or a cemented pan, depth to a water table, and ponding. The properties that affect performance include depth to bedrock or a cemented pan, bulk density, the sodium adsorption ratio, salinity, reaction, and the cation-exchange capacity, which is used to estimate the capacity of a soil to adsorb heavy metals. Permanently frozen soils are not suitable for disposal of wastewater by irrigation.

Overland flow of wastewater is a process in which wastewater is applied to the upper reaches of sloped land and allowed to flow across vegetated surfaces, sometimes called terraces, to runoff-collection ditches. The length of the run generally is 150 to 300 feet. The application rate ranges from 2.5 to 16.0 inches per week. It commonly exceeds the rate needed for irrigation of cropland. The wastewater leaves solids and nutrients on the vegetated surfaces as it flows downslope in a thin film. Most of the water reaches the collection ditch, some is lost through evapotranspiration, and a small amount may percolate to the ground water.

The ratings in the table are based on the soil properties that affect absorption, plant growth, microbial activity, and the design and construction of the system. Reaction and the cation-exchange capacity affect absorption. Reaction, salinity, and the sodium adsorption ratio affect plant growth and microbial activity. Slope, permeability, depth to a water table, ponding, flooding, depth to bedrock or a cemented pan, stones, and

cobbles affect design and construction. Permanently frozen soils are unsuitable for waste treatment.

Rapid infiltration of wastewater is a process in which wastewater applied in a level basin at a rate of 4 to 120 inches per week percolates through the soil. The wastewater may eventually reach the ground water. The application rate commonly exceeds the rate needed for irrigation of cropland. Vegetation is not a necessary part of the treatment; hence, the basins may or may not be vegetated. The thickness of the soil material needed for proper treatment of the wastewater is more than 72 inches. As a result, geologic and hydrologic investigation is needed to ensure proper design and performance and to determine the risk of ground-water pollution.

The ratings in the table are based on the soil properties that affect the risk of pollution and the design, construction, and performance of the system. Depth to a water table, ponding, flooding, and depth to bedrock or a cemented pan affect the risk of pollution and the design and construction of the system. Slope, stones, and cobbles also affect design and construction. Permeability and reaction affect performance. Permanently frozen soils are unsuitable for waste treatment.

Slow rate treatment of wastewater is a process in which wastewater is applied to land at a rate normally between 0.5 inch and 4.0 inches per week. The application rate commonly exceeds the rate needed for irrigation of cropland. The applied wastewater is treated as it moves through the soil. Much of the treated water may percolate to the ground water, and some enters the atmosphere through evapotranspiration. The applied water generally is not allowed to run off the surface. Waterlogging is prevented either through control of the application rate or through the use of tile drains, or both.

The ratings in the table are based on the soil properties that affect absorption, plant growth microbial activity, erodibility, and the application of waste. The properties that affect absorption include the sodium adsorption ratio, depth to a water table, ponding, available water capacity, permeability, depth to bedrock or a cemented pan, reaction, the cation-exchange capacity, and slope. Reaction, the sodium adsorption ratio, salinity, and bulk density affect plant growth and microbial activity. The wind erodibility group, the soil erodibility factor K, and slope are considered in estimating the likelihood of wind erosion or water erosion. Stones, cobbles, a water table, ponding, and flooding can hinder the application of waste. Permanently frozen soils are unsuitable for waste treatment.

Construction Materials

Tables 15a and 15b give information about the soils as potential sources of gravel, sand, reclamation material, roadfill, and topsoil. Normal compaction, minor processing, and other standard construction practices are assumed.

Gravel and *sand* are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In table 15a, only the likelihood of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material. The properties used to evaluate the soil as a source of gravel or sand are gradation of grain sizes (as indicated by the Unified classification of the soil), the thickness of suitable material, and the content of rock fragments. If the bottom layer of the soil contains sand or gravel, the soil is considered a likely source regardless of thickness. The assumption is that the sand or gravel layer below the depth of observation exceeds the minimum thickness. The soils are rated *good, fair,* or *poor* as potential sources of sand and gravel. A rating of *good* or *fair* means that the source material is likely to be in or below the soil.

The soils are rated *good, fair,* or *poor* as potential sources of reclamation material, roadfill, and topsoil. The features that limit the soils as sources of these materials are specified in table 15b.

Reclamation material is used in areas that have been drastically disturbed by surface mining or similar activities. When these areas are reclaimed, layers of soil material or unconsolidated geological material, or both, are replaced in a vertical sequence. The reconstructed soil favors plant growth. The ratings in the table do not apply to quarries and other mined areas that require an offsite source of reconstruction material. The ratings are based on the soil properties that affect erosion and stability of the surface and the productive potential of the reconstructed soil. These properties include the content of sodium, salts, and calcium carbonate; reaction; available water capacity; erodibility; texture; content of rock fragments; and content of organic matter and other features that affect fertility.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the whole soil, from the surface to a depth of about 5 feet. It is assumed that soil layers will be mixed when the soil material is excavated and spread.

The ratings are based on the amount of suitable material and on soil properties that affect the ease of excavation and the performance of the material after it is in place. The thickness of the suitable material is a major consideration. The ease of excavation is affected by large stones, depth to a water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the AASHTO classification of the soil) and linear extensibility (shrink-swell potential).

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area. The ratings are based on the soil properties that affect plant growth; the ease of excavating, loading, and spreading the material; and reclamation of the borrow area. Toxic substances, soil reaction, and the properties that are inferred from soil texture, such as available water capacity and fertility, affect plant growth. The ease of excavating, loading, and spreading is affected by rock fragments, slope, depth to a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, depth to a water table, rock fragments, depth to bedrock or a cemented pan, and toxic material.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 16 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed excavated ponds. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect these uses. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is

determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. Embankments that have zoned construction (core and shell) are not considered. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey.

Soil properties are ascertained by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine particle-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

The estimates of soil properties are shown in tables. They include engineering index properties, physical and chemical properties, and pertinent soil and water features.

Engineering Index Properties

Table 17 gives the engineering classifications and the range of index properties for the layers of each soil in the survey area.

Depth to the upper and lower boundaries of each layer is indicated.

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter (fig. 8). “Loam,” for example, is soil

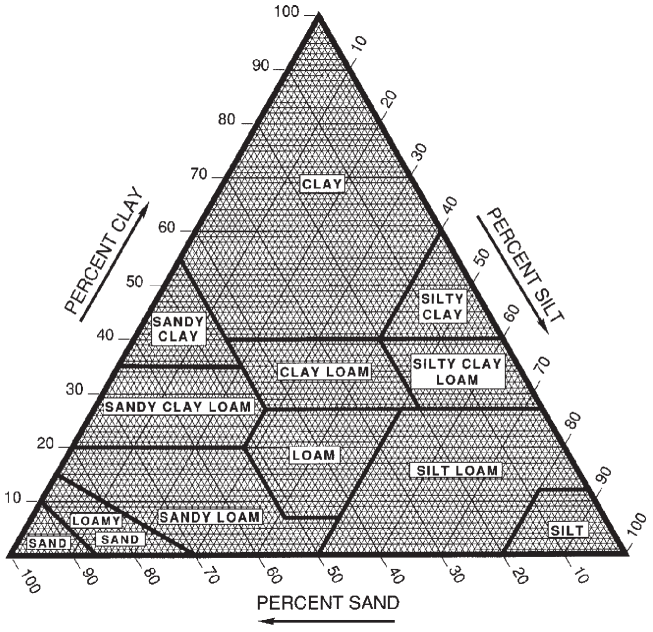

Figure 8.—Percentages of clay, silt, and sand in the basic USDA soil textural classes.

that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is 15 percent or more, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (ASTM, 2001) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 2000).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to particle-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of particle-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of particle-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is generally omitted in the table.

Physical Properties

Table 18 shows estimates of some physical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Particle size is the effective diameter of a soil particle as measured by sedimentation, sieving, or micrometric methods. Particle sizes are expressed as classes with specific effective diameter class limits. The broad classes are sand, silt, and clay, ranging from the larger to the smaller.

Sand as a soil separate consists of mineral soil particles that are 0.05 millimeter to 2 millimeters in diameter. In the table, the estimated sand content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

Silt as a soil separate consists of mineral soil particles that are 0.002 to 0.05 millimeter in diameter. In the table, the estimated silt content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In the table, the estimated clay content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of sand, silt, and clay affects the physical behavior of a soil. Particle size is important for engineering and agronomic interpretations, for determination of soil hydrologic qualities, and for soil classification.

The amount and kind of clay affect the fertility and physical condition of the soil and the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at $^1/_3$- or $^1/_{10}$-bar (33kPa or 10kPa) moisture tension. Weight is determined after the soil is dried at 105 degrees C. In the table, the estimated moist bulk density of each soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. Depending on soil texture, a bulk density of more than 1.4 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability (K_{sat}) refers to the ability of a soil to transmit water or air. The term "permeability," as used in soil surveys, indicates saturated hydraulic conductivity (K_{sat}). The estimates in the table indicate the rate of water movement, in inches per hour, when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each soil layer. The capacity varies, depending on soil properties that affect retention of water. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Linear extensibility refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. It is an expression of the volume change between the water content of the clod at $^1/_3$- or $^1/_{10}$-bar tension (33kPa or 10kPa tension) and oven dryness. The volume change is reported in the table as percent change for the whole soil. Volume change is influenced by the amount and type of clay minerals in the soil.

Linear extensibility is used to determine the shrink-swell potential of soils. The shrink-swell potential is low if the soil has a linear extensibility of less than 3 percent; moderate if 3 to 6 percent; high if 6 to 9 percent; and very high if more than 9 percent. If

the linear extensibility is more than 3, shrinking and swelling can cause damage to buildings, roads, and other structures and to plant roots. Special design commonly is needed.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In the table, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained by returning crop residue to the soil. Organic matter has a positive effect on available water capacity, water infiltration, soil organism activity, and tilth. It is a source of nitrogen and other nutrients for crops and soil organisms.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of several factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and permeability. Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor Kf indicates the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their susceptibility to wind erosion in cultivated areas. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible. The groups are as follows:

1. Coarse sands, sands, fine sands, and very fine sands.
2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, ash material, and sapric soil material.
3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams.

4L. Calcareous loams, silt loams, clay loams, and silty clay loams.

4. Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay.
5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material.
6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay.
7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material.
8. Soils that are not subject to wind erosion because of rock fragments on the surface or because of surface wetness.

Wind erodibility index is a numerical value indicating the susceptibility of soil to wind erosion, or the tons per acre per year that can be expected to be lost to wind erosion. There is a close correlation between wind erosion and the texture of the surface layer, the size and durability of surface clods, rock fragments, organic matter, and a calcareous reaction. Soil moisture and frozen soil layers also influence wind erosion.

Chemical Properties

Table 19 shows estimates of some chemical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Cation-exchange capacity is the total amount of extractable bases that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. Soils having a low cation-exchange capacity hold fewer cations and may require more frequent applications of fertilizer than soils having a high cation-exchange capacity. The ability to retain cations reduces the hazard of ground-water pollution.

Soil reaction is a measure of acidity or alkalinity. The pH of each soil horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Calcium carbonate equivalent is the percent of carbonates, by weight, in the fraction of the soil less than 2 millimeters in size. The availability of plant nutrients is influenced by the amount of carbonates in the soil. Incorporating nitrogen fertilizer into calcareous soils helps to prevent nitrite accumulation and ammonium-N volatilization.

Gypsum is expressed as a percent, by weight, of hydrated calcium sulfates in the fraction of the soil less than 20 millimeters in size. Gypsum is partially soluble in water. Soils that have a high content of gypsum may collapse if the gypsum is removed by percolating water.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Sodium adsorption ratio (SAR) is a measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from saturated soil paste. It is the ratio of the Na concentration divided by the square root of one-half of the Ca + Mg concentration. Soils that have SAR values of 13 or more may be characterized by an increased dispersion of organic matter and clay particles, reduced permeability and aeration, and a general degradation of soil structure.

Soil Features

Table 20 gives estimates of various soil features. The estimates are used in land use planning that involves engineering considerations.

A *restrictive layer* is a nearly continuous layer that has one or more physical, chemical, or thermal properties that significantly impede the movement of water and air through the soil or that restrict roots or otherwise provide an unfavorable root environment. Examples are bedrock, cemented layers, dense layers, and frozen layers. The table indicates the thickness of the restrictive layer which significantly affects the ease of excavation. *Depth to top* is the vertical distance from the soil surface to the upper boundary of the restrictive layer.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible.

Frost heave and low soil strength during thawing cause damage to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that corrodes or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel or concrete in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than the steel or concrete in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low, moderate,* or *high,* is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion also is expressed as *low, moderate,* or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Water Features

Table 21 gives estimates of various water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

The *months* in the table indicate the portion of the year in which the feature is most likely to be a concern.

Ponding is standing water in a closed depression. Unless a drainage system is installed, the water is removed only by percolation, transpiration, or evaporation. Table 21 indicates *surface water depth* and the *duration* and *frequency* of ponding. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 to 30 days, and *very long* if more than 30 days. Frequency is expressed as none, rare, occasional, and frequent. *None* means that ponding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance of ponding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs, on the average, once or less in 2 years (the chance of ponding is 5 to 50 percent in any year); and *frequent* that it occurs, on the average, more than once in 2 years (the chance of ponding is more than 50 percent in any year).

Flooding is the temporary inundation of an area caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, and water standing in swamps and marshes is considered ponding rather than flooding.

Duration and *frequency* are estimated. Duration is expressed as *extremely brief* if 0.1 hour to 4 hours, *very brief* if 4 hours to 2 days, *brief* if 2 to 7 days, *long* if 7 to 30 days, and *very long* if more than 30 days. Frequency is expressed as none, very rare, rare, occasional, frequent, and very frequent. *None* means that flooding is not probable; *very rare* that it is very unlikely but possible under extremely unusual weather conditions (the chance of flooding is less than 1 percent in any year); *rare* that it is unlikely but possible under unusual weather conditions (the chance of flooding is 1 to 5 percent in any year); *occasional* that it occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year); *frequent* that it is likely to occur often under normal weather conditions (the chance of flooding is more than 50 percent in any year but is less than 50 percent in all months in any year); and *very frequent* that it is likely to occur very often under normal weather conditions (the chance of flooding is more than 50 percent in all months of any year).

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (Soil Survey Staff, 1998; Soil Survey Staff, 1999). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 22 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Twelve soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Mollisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Udoll (*Ud*, meaning humid, plus *oll*, from Mollisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; type of saturation; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Hapludoll (*Hapl*, meaning minimal horizonation, plus *udoll*, the suborder of the Mollisols that have a udic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic subgroup is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other taxonomic class. Each subgroup is identified by one or more adjectives preceding the name of the great group. An example is Fluventic Hapludolls.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineralogy class, cation-exchange activity class, soil temperature regime, soil depth, and reaction class. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is coarse-silty, mixed, superactive, mesic Fluventic Hapludolls.

SERIES. The series consists of soils within a family that have horizons similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. Characteristics of the soil and the material in which it formed are identified for each series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows

standards in the “Soil Survey Manual” (Soil Survey Division Staff, 1993). Many of the technical terms used in the descriptions are defined in “Soil Taxonomy” (Soil Survey Staff, 1999) and in “Keys to Soil Taxonomy” (Soil Survey Staff, 1998). Unless otherwise indicated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

Benfield Series

The Benfield series consists of moderately deep, well drained, slowly permeable soils that formed in clayey pedisediment over clayey residuum derived from alkaline shale. These soils are on uplands. Slopes range from 3 to 35 percent. The mean annual temperature is about 55 degrees F, and the mean annual precipitation is about 30 inches.

Taxonomic classification: Fine, mixed, superactive, mesic Udertic Argiustolls

Typical Pedon

Benfield silty clay loam, in an area of native range about 3 miles west and 3.5 miles north of Manhattan, in Riley County, Kansas; 1,530 feet east and 40 feet north of the southwest corner of sec. 27, T. 9 S., R. 7 E.; Keats USGS topographic quadrangle. (Colors are for dry soil unless otherwise indicated.)

A1—0 to 6 inches; black (10YR 2/1) exterior, gravelly silty clay loam, very dark gray (10YR 3/1) exterior, dry; moderate medium granular structure; friable, hard; many fine roots throughout; 20 percent subangular 20 to 75 mm cherty limestone fragments; noneffervescent; clear wavy boundary.

A2—6 to 12 inches; very dark brown (10YR 2/2) exterior, gravelly silty clay loam, very dark grayish brown (10YR 3/2) exterior, dry; moderate very fine and fine subangular blocky structure; firm; many fine roots throughout; 5 percent subangular 75 to 250 mm cherty limestone fragments and 20 percent subangular 20 to 75 mm cherty limestone fragments; noneffervescent; clear wavy boundary.

2Bt1—12 to 20 inches; very dark brown (7.5YR 2/3) exterior and dark brown (7.5YR 3/3) crushed, silty clay; moderate fine subangular blocky structure; very firm; common fine roots throughout; 15 percent patchy distinct very dark brown (7.5YR 2/3) (moist) clay films on faces of peds; 5 percent subangular 2 to 75 mm cherty limestone fragments; noneffervescent; gradual wavy boundary.

2Bt2—20 to 26 inches; reddish brown (5YR 4/3) crushed, and dark reddish brown (5YR 3/3) exterior, silty clay; moderate medium subangular blocky structure; very firm; common fine roots throughout; 15 percent patchy distinct dark brown (7.5YR 3/2) (moist) clay films on faces of peds; strong effervescence; clear wavy boundary.

2Btk—26 to 33 inches; dark reddish gray (5YR 4/2) exterior, silty clay; weak medium subangular blocky structure; firm; common fine roots throughout; 5 percent patchy distinct dark brown (7.5YR 3/3) (moist) clay films on faces of peds; 5 percent fine spherical carbonate nodules between peds; strong effervescence; abrupt wavy boundary.

3BCk—33 to 39 inches; olive (5Y 5/4) exterior, very paragravelly silty clay loam; weak fine subangular blocky structure; firm; 10 percent fine irregular carbonate nodules between peds; 60 percent rounded 2 to 75 mm shale fragments; violent effervescence; clear wavy boundary.

3Cr—39 to 44 inches; weathered, calcareous, olive colored shale.

Range in Characteristics

Depth to paralithic contact: 20 to 40 inches
Thickness of the mollic epipedon: 7 to 20 inches to shale

Content of rock fragments: 0 to 30 percent from 2 mm to 3 inches in diameter; fewer coarse fragments ranging from 3 to 10 inches in diameter

A horizon:
Hue—7.5YR, 10YR, or 2.5Y
Value—3 to 5 dry, 2 or 3 moist
Chroma—1 or 2, dry or moist
Texture—gravelly silty clay loam, silt loam, or silty clay loam
Content of clay—25 to 35 percent
Reaction—slightly acid to slightly alkaline

2Bt horizon:
Hue—5YR to 10YR
Value—4 to 6 dry, 3 to 5 moist
Chroma—2 to 6, dry or moist
Texture—silty clay, silty clay loam, clay, or their gravelly counterparts
Content of clay—35 to 60 percent
Reaction—neutral to moderately alkaline

3BC horizon:
Hue—5YR to 5Y
Value—5 to 7 dry, 4 to 6 moist
Chroma—2 to 4, dry or moist
Texture—silty clay loam, clay, or silty clay, or their paragravelly counterparts
Reaction—slightly alkaline or moderately alkaline

Clime Series

The Clime series consists of moderately deep, well drained, slowly permeable soils that formed in residuum from calcareous clayey shale. These soils are on uplands. Slopes range from 1 to 60 percent. The mean annual air temperature is 56 degrees F, and the mean annual precipitation is 31 inches.

Taxonomic classification: Fine, mixed, active, mesic Udorthentic Haplustolls

Typical Pedon

Clime silty clay, on a northeast-facing 5 percent slope, in an area of rangeland about 4 miles north and 0.5 mile west of Cottonwood Falls, in Chase County, Kansas; 820 feet west and 1,800 feet south of the northeast corner of sec. 31, T. 18 S., R. 8 E. (Colors are for dry soil unless otherwise indicated.)

A—0 to 9 inches; dark grayish brown (10YR 4/2) silty clay, very dark brown (10YR 2/2) moist; moderate fine granular structure; hard, firm; many roots; slight effervescence; moderately alkaline; clear smooth boundary.
Bw—9 to 18 inches; grayish brown (10YR 5/2) silty clay, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky structure; very hard, very firm; few roots; strong effervescence; moderately alkaline; clear smooth boundary.
C—18 to 33 inches; light brownish gray (10YR 6/2) silty clay, dark grayish brown (10YR 4/2) moist; massive; very hard, very firm; horizon contains many shale fragments; strong effervescence; moderately alkaline; diffuse smooth boundary.
Cr—33 to 60 inches; light gray (10YR 7/2) consolidated, calcareous clay shale.

Range in Characteristics

Depth to mollic epipedon: 7 to 20 inches
Depth to shale: 20 to 40 inches
Depth to free carbonates: 0 to 10 inches

Reaction: Slightly alkaline or moderately alkaline throughout; neutral to a depth of 10 inches in some pedons

A horizon:
- Hue—10YR or 2.5Y
- Value—3 to 5 dry, 2 or 3 moist
- Chroma—1 or 2
- Texture—silty clay or silty clay loam
- Content of rock fragments—stony and very stony surface phases included in the range; limestone fragments on the surface (3 inches to 2 feet in diameter) range from .01 to 3 percent, by volume

Bw horizon:
- Hue—10YR or 2.5Y
- Value—4 to 7 dry, 3 to 6 moist
- Chroma—1 to 4
- Texture—silty clay, clay, or silty clay loam
- Content of rock fragments—shale fragments (less than 3 inches in diameter) range from 0 to 10 percent

C horizon:
- Hue—10YR, 2.5Y, or 5Y
- Value—5 to 7 dry, 4 to 6 moist
- Chroma—2 to 4
- Texture—silty clay, clay, or silty clay loam
- Content of rock fragments—shale fragments less than 35 percent, by volume

Crete Series

The Crete series consists of very deep, moderately well drained soils that formed in loess. These soils are on uplands and stream terraces. Permeability is slow. Slopes range from 0 to 11 percent. The mean annual precipitation is about 30 inches, and the mean annual temperature is about 53 degrees F.

Taxonomic classification: Fine, smectitic, mesic Pachic Argiustolls

Typical Pedon

Crete silt loam, in a cultivated field about 5.5 miles east and 1.5 miles north of Dorchester, in Saline County, Nebraska; 2,000 feet south and 100 feet west of the northeast corner of sec. 18, T. 8 N., R. 4 E. (Colors are for dry soil unless otherwise indicated.)

Ap—0 to 6 inches; very dark gray (10YR 3/1) silt loam, black (10YR 2/1) moist; weak very fine granular structure; slightly hard, friable; moderately acid; abrupt smooth boundary.

A—6 to 14 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; moderate medium blocky structure parting to moderate fine granular; hard, friable; moderately acid; clear smooth boundary.

BA—14 to 19 inches; dark gray (10YR 4/1) silty clay loam, very dark brown (10YR 2/2) moist; moderate fine subangular blocky structure; hard, firm; faint gray coatings on faces of peds; moderately acid; clear smooth boundary.

Bt1—19 to 28 inches; dark brown (10YR 4/3) silty clay, dark brown (10YR 3/3) moist; moderate coarse prismatic structure parting to strong medium blocky; very hard, very firm; few fine soft dark brown accumulations (iron and manganese oxide); slightly acid; gradual smooth boundary.

Bt2—28 to 35 inches; brown (10YR 5/3) silty clay, dark brown (10YR 4/3) moist; moderate medium prismatic structure parting to strong medium blocky; very hard, very firm; few fine dark brown accumulations (iron and manganese oxide); few fine soft accumulations of calcium carbonate; neutral; gradual smooth boundary.

BC—35 to 42 inches; light olive brown (2.5Y 5/4) silty clay, olive brown (2.5Y 4/4) moist; moderate medium blocky structure; very hard, very firm; many small soft accumulations of calcium carbonate; strong effervescence; slightly alkaline; clear wavy boundary.

C—42 to 60 inches; light yellowish brown (2.5Y 6/4) silty clay loam, light olive brown (2.5Y 5/4) moist; few faint gray (10YR 6/1) and brownish yellow (10YR 6/6) iron stains in the matrix; massive; slightly hard, firm; few soft masses of calcium carbonate; strong effervescence; slightly alkaline.

Range in Characteristics

Thickness of the solum: 24 to 50 inches

Thickness of the mollic epipedon: 20 to 36 inches; includes all of the A horizon and the upper part of the B horizon

Depth to carbonates: 25 to 40 inches; some pedons do not have carbonates; carbonates are generally in the form of concretions or soft accumulations; the soil mass between the accumulations is often noncalcareous; small, dark brown, easily crushed accumulations (iron-manganese) are common in the B and C horizons.

A horizon:

Hue—10YR
Value—3 to 5 dry, 2 or 3 moist
Chroma—1 or 2
Texture—silt loam or silty clay loam
Reaction—strongly acid or moderately acid

Bt horizon:

Hue—10YR (upper part); 10YR or 2.5Y (lower part)
Value—4 or 5 dry, 3 moist (upper part); 4 to 7 dry, 4 or 5 moist (lower part)
Chroma—2 or 3 (upper part); 2 to 4 (lower part)
Texture—silty clay (upper part); silty clay loam or silty clay (lower part)
Content of clay—45 to 52 percent clay, full range of 42 to 55 percent (upper part); slightly less (lower part)
Reaction—slightly acid or neutral (upper part); moderately acid to slightly alkaline (lower part)

BC horizon (if it occurs):

Hue—10YR, 2.5Y, or 5Y
Value—5 to 7 dry, 4 to 6 moist
Chroma—2 to 4
Texture—silty clay or silty clay loam
Redoximorphic concentrations—iron stains in the matrix with hue of 10YR or 7.5YR; value of 5 or 6, 4 or 5 moist; and chroma of 1 to 8 in some pedons.
Reaction—neutral to moderately alkaline

C horizon:

Hue—10YR, 2.5Y, or 5Y
Value—5 to 7 dry, 4 to 6 moist
Chroma—2 to 4
Texture—silty clay loam or silt loam
Redoximorphic concentrations—iron stains in the matrix with hue of 10YR or 7.5YR; value of 5 or 6, 4 or 5 moist; and chroma of 1 to 8 in some pedons.
Reaction—neutral to moderately alkaline

Eudora Series

The Eudora series consists of very deep, well drained soils that formed in silty or loamy alluvium. These soils are on flood-plain steps. Permeability is moderate. Slopes range from 0 to 2 percent. The mean annual air temperature is 54 degrees F, and the mean annual precipitation is 36 inches.

Taxonomic classification: Coarse-silty, mixed, superactive, mesic Fluventic Hapludolls

Typical Pedon

Eudora silt loam, in a cultivated field 2 miles east and 0.5 mile south of Bonner Springs, in Johnson County, Kansas; 200 feet north of the center of sec. 34, T. 11 S., R. 23 E. (Colors are for moist soil unless otherwise indicated.)

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) dry; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; neutral; abrupt smooth boundary.

A—7 to 14 inches; very dark grayish brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) dry; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; neutral; clear smooth boundary.

C1—14 to 40 inches; grayish brown (10YR 5/2) silt loam, light brownish gray (10YR 6/2) dry; massive; soft, very friable, slightly sticky and slightly plastic; neutral; gradual smooth boundary.

C2—40 to 48 inches; grayish brown (10YR 5/2) very fine sandy loam, light brownish gray (10YR 6/2) dry; massive; soft, very friable, nonsticky and nonplastic; moderately alkaline; gradual smooth boundary.

C3—48 to 80 inches; grayish brown (10YR 5/2) silt loam, light brownish gray (10YR 6/2) dry; massive; soft, very friable, nonsticky and nonplastic; slight effervescence; moderately alkaline.

Range in Characteristics

Depth to faint redoximorphic concentrations: Below 30 inches in some pedons
Thickness of particle-size control section: 10 to 40 inches
Content of clay in the particle-size control section (weighted average): 5 to 18 percent
Content of sand in the particle-size control section (weighted average): 10 to 50 percent

A horizon:
- Hue—10YR
- Value—2 or 3 moist, 3 or 5 dry
- Chroma—1 or 2
- Texture—silt loam, loam, very fine sandy loam, or fine sandy loam
- Content of clay—10 to 18 percent
- Reaction—strongly acid to slightly alkaline

AC horizon:
- Hue—10YR
- Value—2 or 3 moist, 3 or 5 dry
- Chroma—1 to 3
- Texture—silt loam, loam, very fine sandy loam, or fine sandy loam
- Content of clay—5 to 18 percent
- Reaction—strongly acid to slightly alkaline

C horizon:
- Hue—10YR
- Value—4 to 6 moist, 5 to 7 dry
- Chroma—1 to 3

Texture—silt loam, loam, or very fine sandy loam
Content of clay—5 to 18 percent
Calcium carbonate equivalent—0 to 5 percent
Reaction—strongly acid to moderately alkaline

Florence Series

The Florence series consists of deep, well drained soils that formed in residuum from cherty limestone. These soils are on uplands. Permeability is moderately slow. Slopes range from 2 to 15 percent. The mean annual air temperature is 53 degrees F, and the mean annual precipitation is 32 inches.

Taxonomic classification: Clayey-skeletal, smectitic, mesic Udic Argiustolls

Typical Pedon

Florence gravelly silt loam, in an area of rangeland about 4 miles west and 5 miles south of Council Grove, in Morris County, Kansas; 2,200 feet north and 800 feet east of the center of sec. 7, T. 17 S., R. 8 E. (Colors are for dry soil unless otherwise indicated.)

A1—0 to 4 inches; dark grayish brown (10YR 4/2) gravelly silt loam, very dark brown (10YR 2/2) moist; moderate medium granular structure; slightly hard, friable; many medium roots; 15 percent chert fragments 1/4 inch to 2 inches in diameter; neutral; clear smooth boundary.

A2—4 to 11 inches; dark grayish brown (10YR 4/2) extremely gravelly silty clay loam, very dark brown (10YR 2/2) moist; moderate medium and fine granular structure; slightly hard, friable; many medium roots; 80 percent chert fragments 1/4 inch to 4 inches in diameter; slightly acid; gradual smooth boundary.

BA—11 to 15 inches; brown (7.5YR 4/2) extremely gravelly silty clay loam, dark brown (7.5YR 3/2) moist; strong fine and very fine subangular blocky structure; hard, firm; many fine roots; 80 percent chert fragments up to 4 inches in diameter; slightly acid; gradual smooth boundary.

Bt—15 to 44 inches; dark reddish brown (2.5YR 3/4) extremely cobbly clay, dark red (2.5YR 3/6) moist; strong medium and fine blocky structure; extremely hard, very firm; common fine roots; few faint discontinuous clay films on faces of peds; common dark stains and fine black concretions; 80 percent chert fragments 4 to 8 inches in diameter; slightly acid; clear irregular boundary.

R—44 inches; cherty limestone that has a few vertical and lateral fractures.

Range in Characteristics

Depth to mollic epipedon: 10 to 20 inches
Depth to bedrock: 40 to 60 inches; cherty limestone or limestone

A horizon:
Hue—10YR or 7.5YR
Value—3 or 4 dry, 2 or 3 moist
Chroma—1 or 2
Texture—silt loam or silty clay loam, or their gravelly and extremely gravelly counterparts
Content of rock fragments—0 to 80 percent coarse fragments
Reaction—moderately acid to neutral

Bt horizon:
Hue—7.5YR, 5YR, or 2.5YR
Value—3 to 5, dry or moist

Chroma—3 to 6
Texture—gravelly to extremely gravelly, or the cobbly or extremely cobbly counterparts of silty clay or clay
Content of rock fragments—35 to 80 percent coarse fragments
Fine earth fraction—50 to 80 percent clay
Reaction—slightly acid to slightly alkaline
Redoximorphic concentrations—mottles with hue of 5YR to 2.5Y, value of 4 or 5 moist, and chroma of 3 to 6 in some pedons
Depth to carbonate concretions or seams of calcium carbonate—below a depth of 30 inches in some pedons

Geary Series

The Geary series consists of very deep, well drained, moderately or moderately slowly permeable soils that formed in loess. These soils are on uplands. Slopes range from 0 to 31 percent. The mean annual precipitation is 26 inches, and the mean annual temperature is 55 degrees F.

Taxonomic classification: Fine-silty, mixed, superactive, mesic Udic Argiustolls

Typical Pedon

Geary silt loam, in a cultivated field about 9 miles east and 0.5 mile north of the Salina Post Office in Saline County, Kansas; 240 feet west and 70 feet south of the center of sec. 9, T. 14 S., R. 1 W. (Colors are for dry soil unless otherwise indicated.)

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; weak fine granular structure; hard, friable, slightly sticky and slightly plastic; few fine roots; moderately acid; gradual smooth boundary.
BA—9 to 15 inches; brown (7.5YR 4/4) silty clay loam, dark brown (7.5YR 3/2) moist; moderate fine subangular blocky structure; very hard, firm, slightly sticky and slightly plastic; few fine roots; moderately acid; gradual smooth boundary.
Bt1—15 to 23 inches; brown (7.5YR 4/4) silty clay loam, dark brown (7.5YR 3/4) moist and brown (7.5YR 4/4) rubbed, moist; moderate fine and very fine subangular blocky structure; very hard, firm, sticky and plastic; few faint clay films on horizontal and vertical faces of peds; slightly acid; gradual smooth boundary.
Bt2—23 to 32 inches; brown (7.5YR 4/4) silty clay loam, dark brown (7.5YR 3/4) moist, and brown (7.5YR 4/4) rubbed, moist; moderate medium subangular blocky structure; very hard, firm, sticky and plastic; few faint clay films on faces of some peds; slightly acid; gradual smooth boundary.
BC—32 to 42 inches; brown (7.5YR 5/4) silty clay loam, brown (7.5YR 4/4) moist; weak coarse subangular blocky structure; very hard, friable, slightly sticky and slightly plastic; neutral; gradual smooth boundary.
C—42 to 60 inches; reddish brown (5YR 5/3) silty clay loam, reddish brown (5YR 4/3) moist; massive; hard, friable, slightly sticky and slightly plastic; few fine tubular pores; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 10 to 20 inches thick
Depth to free carbonates: Below 60 inches; carbonates between a depth of 36 and 60 inches in some pedons

A horizon:
Hue—7.5YR or 10YR
Value—3 to 5 dry, 2 or 3 moist
Chroma—2 or 3

Texture—silt loam, silty clay loam, or clay loam
Reaction—moderately acid or slightly acid

Bt horizon:
Hue—7.5YR or 5YR
Value—4 to 6 dry, 3 to 5 moist
Chroma—3 to 6
Texture—silty clay loam or clay loam
Content of clay—27 to 35 percent
Reaction—moderately acid to slightly alkaline

C horizon:
Hue—10YR, 7.5YR, or 5YR
Value—5 to 7 dry, 4 or 5 moist
Chroma—3 to 6
Texture—silty clay loam, silt loam, loam, or clay loam
Reaction—slightly acid to moderately alkaline

Haynie Series

The Haynie series consists of very deep, moderately well drained soils that formed in calcareous alluvium. These soils are on flood plains. Slopes range from 0 to 5 percent. The mean annual air temperature is about 51 degrees F, and the mean annual precipitation is about 28 inches.

Taxonomic classification: Coarse-silty, mixed, superactive, calcareous, mesic Mollic Udifluvents

Typical Pedon

Haynie silt loam, on a nearly level slope, in a cultivated field, at an elevation of 1,065 feet above sea level about 1.5 miles west and 1 mile north of Whiting, in Monona County, Iowa; about 790 feet west and 1,420 feet north of the center of sec. 34, T. 85 N., R. 46 W.; Sloan USGS quadrangle; lat. 42 degrees 08 minutes 20 seconds N. and long. 96 degrees 11 minutes 15 seconds W., NAD 27. (Colors are for moist soil unless otherwise indicated.)

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (2.5Y 5/2) dry; small clods parting to weak fine subangular blocky and weak fine granular structure; some stratification of lighter colors in the lower part; very friable; few dark brown (10YR 3/3) organic stains on faces of peds; slight effervescence; slightly alkaline; clear smooth boundary.

C—7 to 60 inches; alternating layers of dark grayish brown (10YR 4/2) and grayish brown (10YR 5/2) silt loam, light brownish gray (2.5Y 6/2) dry; massive with weak thin alluvial stratification; common 1/4- to 1/8-inch lenses of very fine sandy loam; a lens of very fine sandy loam at a depth of 10 to 13 inches; very friable; common fine distinct gray (5Y 5/1) redoximorphic depletions; few fine distinct dark yellowish brown (10YR 4/4) and few fine prominent yellowish brown (10YR 5/6) redoximorphic concentrations; not all strata have redoximorphic features; strong effervescence; slightly alkaline.

Range in Characteristics

Depth to carbonates: 0 to 10 inches
Depth to redoximorphic concentrations: 6 to 10 inches
Thickness of the ochric epipedon: Less than 10 inches
Content of clay in the particle-size control section (weighted average): 15 to 18 percent

Content of sand in the particle-size control section (weighted average): 18 to 80 percent mostly very fine sand; less than 15 percent fine and coarser sand

Ap horizon:
Hue—10YR or 2.5Y
Value—3, moist or dry
Chroma—2
Texture—silt loam, very fine sandy loam, or silty clay loam
Content of clay—15 to 30 percent
Content of sand—18 to 55 percent
Calcium carbonate equivalent—0 to 25 percent
Reaction—neutral or slightly alkaline

C horizon:
Hue—10YR or 2.5Y
Value—4 or 5, moist or dry
Chroma—2 to 4
Texture—silt loam or very fine sandy loam; strata of fine sandy loam and loamy fine sand less than 5 inches thick in some pedons; silty clay loam and silty clay strata below a depth of 50 inches in some pedons; sandy materials below a depth of 60 inches in some pedons; thin silty clay layers below a depth of 40 inches in some pedons
Content of clay—15 to 18 percent
Content of sand—18 to 80 percent mostly very fine sand
Calcium carbonate equivalent—3 to 30 percent
Reaction—slightly alkaline or moderately alkaline
Special features—redoximorphic features in this profile are believed to be relict

Hobbs Series

The Hobbs series consists of very deep, well drained, moderately permeable soils that formed in stratified, silty alluvium. These soils are on flood plains, footslopes, and alluvial fans. Slopes range from 0 to 6 percent. The mean annual temperature is 52 degrees F, and the mean annual precipitation is 25 inches at the type location.

Taxonomic classification: Fine-silty, mixed, superactive, nonacid, mesic Mollic Ustifluvents

Typical Pedon

Hobbs silt loam, on slope a less than 1 percent, in an area of bluegrass pasture about 5 miles north and 4 miles west of Superior, in Nuckolls County, Nebraska; 400 feet south and 100 feet east of the northwest corner of sec. 32, T. 2 N., R. 7 W. (Colors are for dry soil unless otherwise indicated.)

A—0 to 7 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium granular structure; hard, friable; neutral; abrupt smooth boundary.
C1—7 to 34 inches; stratified grayish brown (10YR 5/2) and light brownish gray (10YR 6/2) silt loam, very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2) moist; moderate fine and medium granular structure; slightly hard, very friable; neutral; clear smooth boundary.
C2—34 to 44 inches; gray (10YR 5/1) silt loam, dark gray (10YR 4/1) moist; moderate fine and medium granular structure; slightly hard, very friable; neutral; clear smooth boundary.
C3—44 to 60 inches; light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, friable; neutral.

Range in Characteristics

Soil moisture regime: Ustic
Depth to free calcium carbonate: More than 40 inches; thin surface layers of recent deposition containing small amounts of free carbonates in some pedons
Thickness of the mollic epipedon: 6 to 20 inches
Particle-size control section: Silt loam
Content of clay in the particle-size control section (weighted average): 15 to 27 percent
Content of sand in the particle-size control section (weighted average): 0 to 15 percent

A horizon:
Hue—10YR
Value—4 or 5 dry, 2 or 3 moist
Chroma—1 or 2, dry or moist
Texture—silt loam, silty clay loam, very fine sandy loam, or fine sandy loam
Content of clay—10 to 35 percent
Reaction—slightly acid to slightly alkaline
Thickness of the horizon—6 to 20 inches
Special features—thin stratification with material of higher value apparent in undisturbed areas

C horizon:
Hue—10YR or 2.5Y
Value—4 to 7 dry, 3 to 6 moist
Chroma—1 to 3, dry or moist
Texture—silt loam; includes layers of silty clay loam and thin strata of slightly coarser or finer textured material
Content of clay—15 to 30 percent
Reaction—slightly acid to moderately alkaline
Special features—thin strata having colors within the range or having slightly higher or lower value; buried soils common

Holder Series

The Holder series consists of very deep, well drained soils that formed in loess. These soils are on uplands. Permeability is moderate. Slopes range from 0 to 11 percent but are typically less than 4 percent. The mean annual air temperature is about 51 degrees F, and the mean annual precipitation is about 25 inches at the type location.

Taxonomic classification: Fine-silty, mixed, superactive, mesic Udic Argiustolls

Typical Pedon

Holder silt loam, on a slope of less than 1 percent, in a cultivated field in Hamilton County, Nebraska; 400 feet south and 100 feet west of the northeast corner of sec. 3, T. 10 N., R. 8 W. (Colors are for dry soil unless otherwise indicated.)

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; weak fine and medium granular structure; soft, very friable; strongly acid; abrupt smooth boundary.
A—5 to 10 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate medium and coarse granular structure; slightly hard, very friable; moderately acid; clear smooth boundary.
Bt1—10 to 18 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate fine and medium subangular blocky structure; slightly hard, friable; neutral; clear smooth boundary.
Bt2—18 to 23 inches; brown (10YR 5/3) silty clay loam, brown (10YR 4/3) moist;

moderate medium and coarse subangular blocky structure; slightly hard, friable; neutral; clear smooth boundary.

BC—23 to 29 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; weak coarse prismatic structure parting to weak medium subangular blocky; slightly hard, friable; neutral; clear smooth boundary.

C1—29 to 50 inches; very pale brown (10YR 7/3) silt loam, pale brown (10YR 6/3) moist; weak coarse prismatic structure; soft, very friable; slightly alkaline; gradual smooth boundary.

C2—50 to 80 inches; very pale brown (10YR 7/3) silt loam, pale brown (10YR 6/3) moist; few fine faint strong brown (7.5YR 5/6) moist mottles; weak coarse prismatic structure; soft, very friable; soft masses of calcium carbonate accumulations; violent effervescence; moderately alkaline.

Range in Characteristics

Soil moisture: The soil moisture control section is moist in some part from October through April, intermittently moist from May through July, and driest from July through September.

Depth to secondary carbonates: 30 to 60 inches

Thickness of the mollic epipedon: 8 to 20 inches; extends into the upper part of the B horizon in some pedons

Thickness of the solum: 25 to 50 inches

A horizon:

Hue—10YR
Value—3 to 5 dry, 2 or 3 moist
Chroma—1 or 2
Texture—silt loam, but the range includes loam and silty clay loam
Reaction—strongly acid to neutral

BA horizon (if it occurs):

Hue—10YR
Values—4 or 5 dry, 2 or 3 moist
Chroma—2 or 3
Texture—silt loam, loam, or silty clay loam
Reaction—strongly acid to neutral

Bt horizon:

Hue—10YR
Value—4 to 6 dry, 3 to 5 moist
Chroma—2 or 3
Texture—silty clay loam
Content of clay—28 to 35 percent clay
Reaction—slightly acid to slightly alkaline

BC horizon (if it occurs):

Hue—10YR
Value—5 to 7 dry, 4 to 6 moist
Chroma—2 or 3
Texture—silt loam or silty clay loam
Reaction—neutral or slightly alkaline

C horizon:

Hue—10YR
Value—6 or 7 dry, 5 or 6 moist
Chroma—2 or 3
Texture—silt loam or silty clay loam
Reaction—neutral to moderately alkaline

Irwin Series

The Irwin series consists of deep and very deep, moderately well drained soils that formed in clayey sediments. These soils are on uplands. Permeability is very slow. Slopes range from 0 to 8 percent.

Taxonomic classification: Fine, mixed, superactive, mesic Pachic Argiustolls

Typical Pedon

Irwin silty clay loam, in an area of rangeland about 10 miles south of Junction City, in Geary County, Kansas; 2,340 feet east and 320 feet north of the southwest corner of sec. 25, T. 13 S., R. 5 E.; Wreford USGS topographic quadrangle; lat. 38 degrees 53 minutes 06 seconds N. and long. 96 degrees 49 minutes 32 seconds W. (Colors are for dry soil unless otherwise indicated.)

A—0 to 6 inches; very dark gray (10YR 3/1) silty clay loam, very dark brown (10YR 2/2) moist; moderate fine granular structure; hard, friable, slightly sticky and slightly plastic; many fine and medium roots throughout; few distinct gray (10YR 5/1) discontinuous skeletans (sand or silt) on faces of peds; strongly acid; clear smooth boundary.

BA—6 to 13 inches; very dark grayish brown (10YR 3/2) silty clay loam, very dark brown (10YR 2/2) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; many fine roots throughout; few distinct gray (10YR 5/1) discontinuous skeletans (sand or silt) on faces of peds; strongly acid; abrupt smooth boundary.

Bt1—13 to 23 inches; dark grayish brown (10YR 4/2) clay, very dark brown (10YR 2/2) and very dark grayish brown (10YR 3/2) crushed, moist; strong medium subangular blocky structure; very hard, very firm, very sticky and very plastic; common very fine and fine roots throughout; few faint very dark brown (10YR 2/2) continuous clay films (cutans) on faces of peds; slightly acid; gradual smooth boundary.

Bt2—23 to 30 inches; brown (10YR 4/3) clay, dark brown (10YR 3/3) moist; moderate medium blocky structure; extremely hard, extremely firm, very sticky and very plastic; common very fine roots between peds; few faint very dark grayish brown (10YR 3/2) discontinuous clay films (cutans) on faces of peds; neutral; gradual smooth boundary.

Btk—30 to 41 inches; brown (10YR 5/3) silty clay, brown (10YR 4/3) moist; weak medium blocky structure; very hard, very firm, very sticky and very plastic; few very fine roots throughout; very few faint discontinuous clay films (cutans) on faces of peds; common fine and medium rounded lime concretions; slightly alkaline; gradual smooth boundary.

2Bt1—41 to 54 inches; brown (7.5YR 5/4) silty clay loam, brown (7.5YR 4/4) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; very few discontinuous clay films (cutan) on faces of peds; moderately alkaline; clear smooth boundary.

2Bt2—54 to 72 inches; 70 percent brown (7.5YR 4/4), with 30 percent brown (10YR 5/3) silty clay loam; 70 percent dark brown (7.5YR 3/4), with 20 percent brown to brown (10YR 4/3), and 10 percent dark grayish brown (10YR 4/2) moist; weak fine subangular blocky structure; hard, firm, sticky and plastic; very few faint discontinuous clay films (cutans) on faces of peds; 1 percent limestone pebbles; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 20 to 40 inches
Depth to limestone or shale: 40 to more than 60 inches
Depth to a subhorizon containing more than 40 percent clay: Less than 14 inches

Other features: Lime concretions occur below 24 inches in some pedons; a bedrock substratum phase is recognized.

A horizon:
Hue—10YR
Value—4 or 5 dry, 2 or 3 moist
Chroma—1 to 3
Texture—silty clay loam or silty clay
Reaction—moderately acid to neutral

Bt horizon:
Hue—10YR or 7.5YR
Value—4 to 6 dry, 3 or 4 moist
Chroma—2 or 3
Texture—silty clay or clay
Reaction—moderately acid to neutral (upper part); slightly acid to slightly alkaline (lower part)

C horizon:
Hue—2.5Y to 5YR
Value—4 to 6 dry, 3 to 5 moist
Chroma—2 to 5
Texture—silty clay, clay, or silty clay loam; unconforming strata are common; strata with less than 40 percent clay are at a depth below 40 inches
Reaction—neutral to moderately alkaline

Kahola Series

The Kahola series consists of very deep, well drained soils that formed in calcareous silty alluvium. These soils are on flood plains. Permeability is moderate. Slopes range from 0 to 2 percent. The mean annual temperature is 56 degrees F, and the mean annual precipitation is 32 inches.

Taxonomic classification: Fine-silty, mixed, superactive, mesic Cumulic Hapludolls

Typical Pedon

Kahola silt loam, in a cultivated field about 0.5 mile southeast of Wonsevu, in Chase County, Kansas; 660 feet west and 1,450 feet north of the southeast corner of sec. 9, T. 22 S., R. 6 E. (Colors are for moist soil unless otherwise indicated.)

Ap—0 to 9 inches; very dark brown (10YR 2/2) silt loam, dark grayish brown (10YR 4/2) dry; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; slightly acid; clear smooth boundary.
A—9 to 24 inches; very dark brown (10YR 2/2) silt loam, dark grayish brown (10YR 4/2) dry; moderate fine and medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; common wormholes and wormcasts; neutral; gradual smooth boundary.
AC—24 to 35 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; slightly alkaline; gradual smooth boundary.
C—35 to 70 inches; dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; massive; hard, friable, slightly sticky and slightly plastic; strong effervescence; moderately alkaline.

Range in Characteristics

Depth to mollic epipedon: More than 24 inches
Depth to free carbonates: 15 to 40 inches; in the lower part of the mollic epipedon

A horizon:
Hue—10YR, 7.5YR, or 2.5Y
Value—2 or 3 moist, 3 to 5 dry
Chroma—1 to 3
Texture—silt loam or silty clay loam
Reaction—slightly acid to slightly alkaline

AC horizon:
Hue—10YR, 7.5YR, or 2.5Y
Value—2 or 3 moist, 3 to 5 dry
Chroma—1 to 3
Texture—silt loam or silty clay loam
Reaction—neutral to moderately alkaline

C horizon:
Hue—10YR or 7.5YR
Value—2 to 4 moist, 4 or 5 dry
Chroma—2 to 4
Texture—silt loam, loam, or silty clay loam; thin strata with a lower or higher content of clay in some pedons
Reaction—slightly alkaline or moderately alkaline

Konza Series

The Konza series consists of deep and very deep, moderately well drained soils that formed in loess over a paleosol on uplands. These nearly level to gently sloping soils are on ridgetops and upper side slopes in the Bluestem Hills. Permeability is very slow. Slopes range from 0 to 3 percent. The mean annual precipitation is 33 inches, and the mean annual air temperature is 55 degrees F.

Taxonomic classification: Fine, smectitic, mesic Udertic Paleustolls

Typical Pedon

Konza silty clay loam, in an area of rangeland about 13.5 miles south and 4 miles west of Manhattan, in Geary County, Kansas; 800 feet south and 200 feet east of the northwest corner of sec. 25 T. 12 S., R. 7 E.; White City NE. USGS topographic quadrangle; lat. 38 degrees 59 minutes 04 seconds N. and long. 96 degrees 36 minutes 46 seconds W. (Color is for dry soil unless otherwise indicated.)

A—0 to 6 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; moderate medium granular structure; soft, very friable, sticky and plastic; many fine roots throughout; very few distinct dark gray (10YR 4/1) discontinuous skeletans (sand or silt) on faces of peds; slightly acid; clear smooth boundary.

Bt1—6 to 17 inches; dark grayish brown (10YR 4/2) silty clay, very dark brown (10YR 2/2) moist; weak medium columnar structure parting to strong fine and medium angular blocky; very hard, very firm, very sticky and very plastic; common fine roots between peds; common distinct very dark brown (10YR 2/2) continuous clay films (cutans) on vertical and horizontal faces of peds, and few black (10YR 2/1) faint organic coats on vertical faces of peds; moderately acid; gradual smooth boundary.

Bt2—17 to 28 inches; dark grayish brown (10YR 4/2) silty clay, very dark grayish brown (10YR 3/2) moist; moderate medium and coarse subangular blocky structure; very hard, very firm, very sticky and very plastic; common fine roots between peds; many distinct very dark brown (10YR 2/2) continuous clay films (cutans) on vertical and horizontal faces of peds, and few black (10YR 2/1) patchy organic coats on vertical faces of peds; neutral; clear smooth boundary.

Btk1—28 to 34 inches; brown (10YR 5/3) silty clay, brown (10YR 4/3) moist; moderate fine and medium subangular blocky structure; very hard, firm, very sticky and very plastic; few very fine roots between peds; common distinct very dark grayish brown (10YR 3/2) continuous clay films (cutans) on vertical and horizontal faces of peds, and very few very dark brown (10YR 2/2) faint organic coats on vertical faces of peds; few fine rounded carbonate concretions; sodium adsorption ratio of 7; slightly alkaline; clear smooth boundary.

Btk2—34 to 42 inches; mixed brown (10YR 5/3) and grayish brown (10YR 5/2) silty clay loam; mixed brown (10YR 4/3) and dark grayish brown (10YR 4/2) moist; common fine distinct dark yellowish brown (10YR 4/6) mottles; moderate medium subangular blocky structure; hard, firm, very sticky and very plastic; few very fine roots throughout; few distinct dark brown (10YR 3/3) faint clay films (cutans) on vertical faces of peds; common fine and medium rounded carbonate concretions; sodium adsorption ratio of 8; moderately alkaline; clear smooth boundary.

Bt3—42 to 50 inches; mixed grayish brown (10YR 5/2) and light brownish gray (10YR 6/2) silty clay loam; mixed dark grayish brown (10YR 4/2) and grayish brown (10YR 5/2) moist; common fine and medium prominent dark yellowish brown (10YR 4/6) mottles; weak fine and medium subangular blocky structure; hard, friable, sticky and plastic; few very fine roots throughout; very few prominent dark grayish brown (10YR 4/2) faint clay films (cutans) on vertical and horizontal faces of peds; sodium adsorption ratio of 8; moderately alkaline; clear smooth boundary.

2Bt1—50 to 62 inches; mixed brown (7.5YR 4/4) and grayish brown (10YR 5/2) silty clay loam, mixed dark brown (7.5YR 3/4) and dark grayish brown (10YR 4/2) moist; moderate fine and medium subangular blocky structure; hard, firm, sticky and plastic; few distinct dark brown (7.5YR 3/4) faint clay films (cutans) on vertical faces of peds, and very few manganese or iron-manganese stains on faces of peds; sodium adsorption ratio of 8; neutral; gradual smooth boundary.

2Bt2—62 to 70 inches; mixed brown (7.5YR 4/4) and reddish brown (5YR 4/3) silty clay; mixed dark brown (7.5YR 3/4) and dark reddish brown (5YR 3/3) moist; moderate fine and medium subangular blocky structure; very hard, very firm, very sticky and very plastic; common distinct dark reddish brown (5YR 3/3) continuous clay films (cutans) on vertical and horizontal faces of peds, and faint manganese or iron-manganese stains on faces of peds; sodium adsorption ratio of 8; 1 percent gravel, mostly chert and limestone pebbles; slightly alkaline; clear smooth boundary.

2Bt3—70 to 80 inches; reddish brown (5YR 4/3) silty clay; dark reddish brown (5YR 3/3) moist; strong fine and medium angular blocky structure; very hard, very firm, very sticky and very plastic; common distinct dark reddish brown (5YR 3/3) continuous clay films (cutans) on vertical and horizontal faces of peds, and common faint manganese or iron-manganese stains on faces of peds; sodium adsorption ratio 7; 1 percent gravel, mostly chert and limestone pebbles; slightly alkaline.

Range in Characteristics

Depth to the mollic epipedon: 20 to 36 inches
Depth to discontinuity: 35 to 60 inches
Depth to bedrock: 60 to 100 inches

A horizon:
Hue—10YR
Value—3 or 4 dry, 2 or 3 moist
Chroma—1 or 2
Texture—silt loam or silty clay loam
Reaction—moderately acid to neutral

Bt horizon:
Hue—10YR

Value—4 to 6 dry, 2 to 5 moist
Chroma—2 to 4
Texture—silty clay, clay, or silty clay loam
Content of clay—35 to 55 percent
Reaction—moderately acid to neutral (upper part); slightly acid to moderately alkaline (lower part)
Sodium adsorption ratio (SAR)—2 to 12

2Bt horizon:
Hue—7.5YR to 5YR
Value—4 to 6 dry, 3 to 5 moist
Chroma—2 to 4
Texture—silty clay loam or silty clay
Reaction—neutral to moderately alkaline
Sodium adsorption ratio (SAR)—4 to 15

Ladysmith Series

The Ladysmith series consists of very deep, somewhat poorly drained, upland soils that formed in fine textured sediments. These soils occur in the Central Loess Plains (MLRA 75) and in the Central Bluestem Hills (MLRA 76). Permeability is very slow. Slopes range from 0 to 3 percent. The mean annual air temperature is 57 degrees F, and the mean annual precipitation is 32 inches.

Taxonomic classification: Fine, smectitic, mesic Udertic Argiustolls

Typical Pedon

Ladysmith silty clay loam, in a cultivated field about 1 mile west of Delavan and 175 feet north of U.S. Highway 56, in Morris County, Kansas; 1,640 feet west and 2,340 feet north of the southeast corner of sec. 13, T. 16 S., R. 5 E. (Colors are for dry soil unless otherwise indicated.)

Ap—0 to 9 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; moderately acid; clear smooth boundary.

Bt1—9 to 22 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; moderate medium blocky parting to weak very fine blocky structure; very hard, very firm, very sticky and very plastic; few lighter colored thin silty coats on some vertical ped faces; slightly acid; gradual smooth boundary.

Bt2—22 to 36 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; few very dark gray (10YR 3/1) vertical streaks in upper 6 inches and few fine brown (7.5YR 5/4) mottles in lower 4 inches; weak medium blocky structure; very hard, very firm, very sticky and very plastic; neutral; gradual smooth boundary.

BC—36 to 50 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; many coarse distinct brown (7.5YR 4/4) mottles; weak medium blocky structure; very hard, very firm, very sticky and very plastic; few small lime concretions; slightly alkaline; gradual smooth boundary.

C—50 to 80 inches; gray (10YR 6/1) silty clay loam, gray (10YR 5/1) moist; common medium distinct reddish brown (5YR 5/3) and yellowish brown (10YR 5/4) mottles; massive; very hard, firm, very sticky and very plastic; few small black concretions; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 20 to 40 inches
Other features: A few lime concretions occur below a depth of 30 inches in some

pedons; clay content in the boundary between the A and Bt horizons increases less than 15 percent (absolute) within a vertical distance of 1 inch but it does increase 15 to 19 percent (absolute) within a vertical distance of 3 inches.

A horizon:
Hue—10YR
Value—3 to 5 dry, 2 or 3 moist
Chroma—1 or 2
Texture—silt loam or silty clay loam
Reaction—moderately acid to neutral

Bt horizon:
Hue—10YR (upper part); 10YR or 2.5Y (lower part)
Value—3 to 5 dry, 2 or 3 moist (upper part); 4 or 5 dry, 3 or 4 moist (lower part)
Chroma—1 or 2 (upper part); 1 or 2 (lower part)
Texture—clay or silty clay
Content of clay—up to 60 percent
Reaction—moderately acid to slightly alkaline (upper part); neutral to moderately alkaline (lower part)
Redoximorphic features—reddish or brownish mottles in the lower part of most pedons
Special features—upper 6 inches or more of the Bt horizon has value of less than 2.5 moist if chroma is more than 1.5

C horizon:
Hue—10YR, 2.5Y, or 5Y
Value—5 to 7 dry, 4 to 6 moist
Chroma—1 to 3
Redoximorphic features—reddish or brownish mottles in most pedons
Texture—silty clay, silty clay loam, or clay; more clayey or sandy soil material constituting an unconformity occur in some pedons at a depth of more than 40 inches
Reaction—slightly alkaline to moderately alkaline

Longford Series

The Longford series consists of deep and very deep, well drained soils that formed in loess and/or silty and loamy alluvium. These soils are on high terraces and uplands. Permeability is slow. Slopes range from 0 to 12 percent.

Taxonomic classification: Fine, smectitic, mesic Udic Argiustolls

Typical Pedon

Longford silt loam, in an area of rangeland about 2 miles south of Miltonvale, in Cloud County, Kansas; about 2,100 feet west and 300 feet south of the northeast corner of sec. 31, T. 8 S., R. 1 W. (Colors are for dry soil unless otherwise indicated.)

A—0 to 10 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; strong fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many fine roots; slightly acid; gradual smooth boundary.
BA—10 to 16 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; strong fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine roots; slightly acid; gradual smooth boundary.
Bt1—16 to 22 inches; brown (7.5YR 5/4) silty clay loam, brown (7.5YR 4/4) moist; strong fine subangular blocky structure; hard, friable, sticky and plastic; dark

grayish brown (10YR 4/2) stains and clay films on faces of peds; few fine roots; slightly acid; gradual smooth boundary.

Bt2—22 to 40 inches; yellowish red (5YR 5/6) silty clay loam, yellowish red (5YR 4/6) moist; strong fine and medium blocky structure; very hard, firm, sticky and plastic; clay films on faces of peds; few coarse roots; slightly acid; gradual smooth boundary.

Bt3—40 to 46 inches; reddish yellow (5YR 6/6) silty clay loam, yellowish red (5YR 5/6) moist; moderate fine and medium subangular blocky structure; hard, friable, sticky and plastic; thin discontinuous clay films on ped faces; few very fine and fine black concretions and sandstone pebbles; slightly acid; gradual smooth boundary.

2BC—46 to 60 inches; reddish yellow (5YR 6/6) clay loam, yellowish red (5YR 5/6) moist; weak fine and medium granular structure; hard, friable, slightly sticky and slightly plastic; few fine and medium black concretions and fine sandstone pebbles; neutral.

Range in Characteristics

Depth to free carbonates: 36 to more than 60 inches

Thickness of the mollic epipedon: 10 to 20 inches thick

Other features: A few small pebbles are in some pedons; some pedons do not have a lithologic discontinuity; a bedrock substratum phase and eroded phase are recognized; some pedons have a BA horizon with color and texture similar to the Bt horizon; if they occur, the 2C and C horizon have color and texture similar to the 2BC horizon; grayish brown or reddish mottles below a depth of 48 inches in some pedons.

A horizon:

Hue—10YR
Value—4 or 5 dry, 2 or 3 moist
Chroma—1 or 2
Texture—silt loam, loam, or silty clay loam
Reaction—moderately acid to neutral

Bt horizon:

Hue—7.5YR or 5YR
Value—4 to 6 dry, 3 to 5 moist
Chroma—2 to 6
Texture—silty clay loam, silty clay, or clay loam
Content of clay—35 to 45 percent
Reaction—slightly acid or neutral

2BC or BC horizon:

Hue—5YR to 10YR
Value—5 to 7 dry, 4 to 6 moist
Chroma—3 to 6
Texture—clay loam, silt loam, silty clay loam, or loam
Reaction—slightly acid to slightly alkaline

McCook Series

The McCook series consists of very deep, well drained soils that formed in stratified, calcareous alluvium. These soils are on flood plains. Permeability is moderate. Slopes range from 0 to 3 percent. The mean annual temperature is 52 degrees F, and the mean annual precipitation is 20 inches at the type location.

Taxonomic classification: Coarse-silty, mixed, superactive, mesic Fluventic Haplustolls

Typical Pedon

McCook silt loam, on a slope of less than 1 percent, in a cultivated field 1 mile south and 3 miles west of McCook, in Red Willow County, Nebraska; 250 feet east and 100 feet south of the center of sec. 34, T. 3 N., R. 30 W. (Colors are for dry soil unless otherwise indicated.)

Ap—0 to 6 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable; slight effervescence; slightly alkaline; abrupt smooth boundary.
A—6 to 15 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure; soft, very friable; slight effervescence; slightly alkaline; abrupt smooth boundary.
AC—15 to 31 inches; light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; weak coarse prismatic structure parting to weak medium and fine granular; soft, very friable; strong effervescence; moderately alkaline; clear smooth boundary.
C1—31 to 38 inches; light brownish gray (10YR 6/2) silt loam, grayish brown (10YR 5/2) moist; massive; soft, very friable; fine stratification in upper part; strong effervescence; moderately alkaline; gradual smooth boundary.
C2—38 to 80 inches; light gray (10YR 7/2) very fine sandy loam, grayish brown (10YR 5/2) moist; massive; soft, very friable; strong effervescence; moderately alkaline.

Range in Characteristics

Depth to mollic epipedon: 10 to 20 inches
Depth to free carbonates: Less than 10 inches; most pedons are calcareous at or near the surface.
Content of clay in the particle-size control section (weighted average): 10 to 18 percent

A horizon:
Hue—10YR
Value—4 or 5 dry, 2 or 3 moist
Chroma—1 or 2
Texture—silt loam; includes very fine sandy loam, loam, fine sandy loam, silty clay loam, or clay loam
Reaction—slightly alkaline or moderately alkaline

AC and C horizons:
Hue—10YR
Value—5 to 7 dry, 4 to 6 moist
Chroma—2 or 3; strata with chroma of 1
Texture—silt loam, very fine sandy loam, or loam; buried soils or thin strata of slightly coarser or finer textured material in the C horizon in most pedons; sandy loam and coarser textures below a depth of 40 inches in some pedons
Reaction—slightly alkaline or moderately alkaline

Muir Series

The Muir series consists of very deep, well drained soils that formed in silty alluvium and colluvium. These soils are on stream terraces and on footslopes. Permeability is moderate. Slopes range from 0 to 7 percent. The mean annual temperature is about 55 degrees F, and the mean annual precipitation is about 30 inches.

Taxonomic classification: Fine-silty, mixed, superactive, mesic Cumulic Haplustolls

Typical Pedon

Muir silt loam, in a cultivated field about 3 miles south and 1 mile west of Clifton, in Clay County, Kansas; 1,200 feet south and 150 feet west of the northeast corner of sec. 22, T. 6 S., R. 1 E. (Colors are for dry soil unless otherwise indicated.)

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many fine roots; moderately acid; clear smooth boundary.

A—7 to 22 inches; very dark grayish brown (10YR 3/2) silt loam, very dark brown (10YR 2/2) moist; moderate medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; common fine roots; slightly acid; gradual smooth boundary.

Bw1—22 to 36 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate very fine blocky structure; hard, firm, slightly sticky and slightly plastic; common very fine roots; slightly acid; gradual smooth boundary.

Bw2—36 to 50 inches; grayish brown (10YR 5/2) silt loam, dark grayish brown (10YR 4/2) moist; moderate very fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; neutral; gradual smooth boundary.

BC—50 to 60 inches; light brownish gray (10YR 6/2) silt loam, grayish brown (10YR 5/2) moist; weak fine subangular blocky structure; hard, firm; slightly acid.

Range in Characteristics

Thickness of the mollic epipedon: 20 to more than 40 inches
Depth to free carbonates: More than 48 inches
Other features: Some pedons have a C horizon with color and texture similar to the BC horizon.

A horizon:
- Hue—10YR
- Value—3 to 5 dry, 2 or 3 moist
- Chroma—1 or 2
- Texture—silt loam; less commonly silty clay loam
- Reaction—moderately acid to neutral

Bw horizon:
- Hue—10YR
- Value—4 to 6 dry, 2 to 4 moist
- Chroma—2 or 3
- Texture—silt loam or silty clay loam; less commonly loam
- Reaction—moderately acid to neutral

BC horizon:
- Hue—10YR or 7.5YR
- Value—4 to 7 dry, 3 to 5 moist
- Chroma—2 to 4
- Texture—silt loam, silty clay loam, or loam
- Reaction—slightly acid to moderately alkaline
- Special features—stratification with varying colors and textures in the BC horizon of some pedons; fine sand or sand below a depth of 40 inches in some pedons

Ortello Series

The Ortello series consists of very deep, well drained soils that formed in loamy and sandy eolian sediments derived from glacial deposits, alluvium, and residuum. These

soils are on uplands and stream terraces. Permeability is moderately rapid. Slopes range from 0 to 30 percent. The mean annual precipitation is 26 inches, and the mean annual air temperature is 48 degrees F at the type location.

Taxonomic classification: Coarse-loamy, mixed, superactive, mesic Udic Haplustolls

Typical Pedon

Ortello fine sandy loam, on a slope of 3 percent, in a cultivated field about 3 miles south and 3 miles west of Emerson, in Thurston County, Nebraska; 500 feet east and 200 feet south of the northwest corner of sec. 18, T. 26 N., R. 6 E. (Colors are for dry soil unless otherwise indicated.)

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark brown (10YR 2/2) moist; weak fine granular structure; loose, very friable; neutral; abrupt smooth boundary.
A—6 to 12 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium blocky structure; slightly hard, very friable; neutral; clear wavy boundary.
AB—12 to 16 inches; brown (10YR 4/3) fine sandy loam, dark brown (10YR 3/3) moist; weak medium blocky structure; slightly hard, very friable; neutral; gradual wavy boundary.
Bw—16 to 28 inches; brown (10YR 5/3) fine sandy loam, brown (10YR 4/3) moist; weak coarse prismatic structure; slightly hard, very friable; neutral; gradual wavy boundary.
BC—28 to 34 inches; yellowish brown (10YR 5/4) fine sandy loam, dark yellowish brown (10YR 4/4) moist; weak coarse prismatic structure; slightly hard, very friable; neutral; gradual wavy boundary.
C—34 to 80 inches; very pale brown (10YR 7/3) loamy fine sand, pale brown (10YR 6/3) moist; single grain; loose; slightly alkaline.

Range in Characteristics

Soil moisture regime: Ustic; the soil is moist in the control section in some part from October through April, intermittently moist from May through July, and driest from July through September.
Thickness of the solum: 24 to 50 inches
Thickness of the mollic epipedon: 8 to 20 inches
Depth to secondary carbonates: Generally below a depth of 60 inches, except where strata of finer textured material are in the underlying material
Rock fragments: A few pebbles are scattered throughout the profile in some areas.

A horizon:
Hue—10YR
Value—3 to 5 dry, 2 or 3 moist
Chroma—1 to 3
Texture—fine sandy loam, loam, very fine sandy loam, sandy loam, or loamy fine sand
Reaction—moderately acid to neutral

B horizon:
Hue—10YR or 7.5Y
Value—4 to 6 dry, 3 to 5 moist
Chroma—2 to 4
Texture—fine sandy loam or sandy loam; commonly becomes coarser with depth
Reaction—slightly acid or neutral

C horizon:
Hue—10YR, 7.5YR, or 2.5Y

Value—5 to 8 dry, 4 to 6 moist
Chroma—2 to 4
Texture—loamy fine sand, loamy sand, fine sandy loam, sandy loam, coarse sandy loam, fine sand, and loamy coarse sand; coarse textures commonly in the lower part of the control section or deeper; silt loam, loam, or very fine sandy loam below a depth of 40 inches in the loamy substratum phase
Reaction—neutral or slightly alkaline

Reading Series

The Reading series consists of very deep, well drained or moderately well drained soils that formed in silty alluvium. These soils are on flood-plain steps and stream terraces. Permeability is moderately slow. The mean annual temperature is 55 degrees F, and the mean annual precipitation is 33 inches.

Taxonomic classification: Fine-silty, mixed, superactive, mesic Pachic Argiudolls

Typical Pedon

Reading silty clay loam, in a cultivated field 0.2 mile east of the Shawnee-Wabaunsee County line on Kansas Highway #4, in Shawnee County, Kansas; 1,200 feet east and 2,540 feet south of the northwest corner of sec. 35, T. 12 S., R. 13 E. (Colors are for moist soil unless otherwise indicated.)

Ap—0 to 6 inches; very dark grayish brown (10YR 3/2) silty clay loam, dark grayish brown (10YR 4/2) dry; moderate fine and medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; moderately acid; abrupt smooth boundary.
A—6 to 14 inches; very dark grayish brown (10YR 3/2) silty clay loam, dark grayish brown (10YR 4/2) dry; moderate fine and medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; moderately acid; gradual smooth boundary.
Bt1—14 to 22 inches; dark brown (10YR 3/3) silty clay loam, brown (10YR 4/3) dry; moderate fine subangular blocky and angular blocky structure; hard, firm, sticky and plastic; few distinct patchy continuous clay films on faces of peds; moderately acid; gradual smooth boundary.
Bt2—22 to 40 inches; dark brown (10YR 3/3) silty clay loam, brown (10YR 4/3) dry; moderate medium and fine subangular blocky and angular blocky structure; hard, firm, sticky and plastic; common distinct continuous clay films on faces of peds; slightly acid; gradual smooth boundary.
Bt3—40 to 56 inches; dark yellowish brown (10YR 4/4) silty clay loam, yellowish brown (10YR 5/4) dry; weak fine subangular blocky structure; hard, firm, sticky and plastic; few distinct patchy clay films on faces of peds; slightly acid; diffuse boundary.
C—56 to 80 inches; dark yellowish brown (10YR 4/4) silty clay loam, yellowish brown (10YR 5/4) dry; massive; hard, firm, sticky and plastic; neutral.

Range in Characteristics

Depth to the argillic horizon: 10 to 20 inches
Depth to calcium carbonate: 40 to 80 inches
Thickness of the mollic epipedon: 16 to 34 inches
Depth to redoximorphic concentrations: 36 to 50 inches; dark yellowish brown iron-manganese concentrations in some pedons.
Particle-size control section (weighted average): 14 to 34 inches
Content of clay in the particle-size control section (weighted average): 27 to 35 percent
Other features: Some pedons have a BC horizon.

A horizon:
- Hue—10YR
- Value—2 or 3 moist, 4 or 5 dry
- Chroma—1 to 3
- Texture—silt loam or silty clay loam
- Content of clay—20 to 32 percent
- Reaction—moderately acid to neutral

Bt horizon:
- Hue—10YR
- Value—2 to 4 moist, 4 to 6 dry
- Chroma—1 to 4
- Texture—silty clay loam
- Content of clay—27 to 35 percent
- Reaction—moderately acid to slightly alkaline

BC horizon:
- Hue—10YR
- Value—4 to 6 moist, 5 to 7 dry
- Chroma—2 to 4
- Texture—silt loam or silty clay loam
- Content of clay—18 to 35 percent
- Reaction—moderately acid to slightly alkaline

C horizon:
- Hue—10YR
- Value—4 to 6 moist, 5 to 7 dry
- Chroma—1 to 4
- Texture—silt loam or silty clay loam
- Content of clay—18 to 35 percent
- Calcium carbonate equivalent—0 to 5 percent
- Reaction—moderately acid to moderately alkaline

Sarpy Series

The Sarpy series consists of very deep, excessively drained soils that formed in sandy alluvium. These soils are on flood plains. Slopes range from 0 to 9 percent. The mean annual precipitation is about 34 inches, and the mean annual air temperature is about 54 degrees F.

Taxonomic classification: Mixed, mesic Typic Udipsamments

Typical Pedon

Sarpy loamy fine sand, on a slope of 3 percent, in a cultivated field at an elevation of 700 feet above sea level about 4 miles southwest of Hardin, in Ray County, Missouri; about 990 feet south and 1,450 feet west of the northeast corner of sec. 19, T. 51 N., R. 26 W.; Lexington East USGS quadrangle; lat. 39 degrees 12 minutes 06 seconds N. and long. 93 degrees 39 minutes 25 seconds W. NAD 27. (Colors are for moist soil unless otherwise indicated.)

Ap—0 to 6 inches; very dark grayish brown (10YR 3/2) loamy fine sand, grayish brown (10YR 5/2) dry; weak fine granular structure; very friable; common fine roots; neutral; abrupt smooth boundary.

C—6 to 60 inches; grayish brown (10YR 5/2) fine sand; single grain; loose; few fine roots in upper part; strongly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 10 to 60 inches
Content of clay in the particle-size control section (weighted average): 2 to 5 percent
Content of sand in the particle-size control section (weighted average): 87 to 95 percent; dominantly fine sand
Other features: The particle-size control section contains less than 10 percent silt and clay, and less than 40 percent silt, clay, and very fine sand

Ap or A horizon:
Hue—10YR or 2.5Y; 10YR or 2.5Y (overwash)
Value—3 to 5 moist, 4 to 6 dry; 3 to 5 moist, 4 to 6 dry (overwash)
Chroma—1 to 3; 1 to 3 (overwash)
Texture—sand, fine sand, loamy sand, loamy fine sand, sandy loam, fine sandy loam, very fine sandy loam, or loam; silt loam, silty clay, or clay (overwash)
Content of clay—2 to 15 percent; 25 to 60 percent (overwash)
Content of sand—35 to 95 percent; 5 to 35 percent (overwash)
Calcium carbonate equivalent—0 to 15 percent; 0 to 15 percent (overwash)
Reaction—neutral to moderately alkaline; neutral to moderately alkaline (overwash)
Thickness of the horizon—2 to 10 inches (overwash)
Special features—surface texture of gravelly loamy sand containing more than 15 percent gravel, by volume, in some pedons

C horizon:
Hue—10YR or 2.5Y
Value—4 to 6, moist or dry
Chroma—2 to 4
Texture—fine sand or sand; textures of silt loam or fine sandy loam below a depth of 60 inches in some pedons
Content of clay—2 to 5 percent
Content of sand—75 to 98 percent
Calcium carbonate equivalent—0 to 15 percent
Reaction—neutral to strongly alkaline
Special features—alluvial stratification is evident throughout the C horizon

Smokyhill Series

The Smokyhill series consists of very deep, moderately well drained soils that formed in clayey over lighter colored silty alluvium. These soils are on high flood plains. Permeability is slow. Slopes are 0 to 1 percent. The mean annual precipitation is 29 inches, and the mean annual air temperature is 55 degrees F.

Taxonomic classification: Clayey over loamy, mixed, superactive, mesic Cumulic Haplustolls

Typical Pedon

Smokyhill silt loam, in a cultivated field about 2.5 miles west and 5 miles south of Junction City, in Geary County, Kansas; 2,600 feet south and 1,500 feet east of the northwest corner of sec. 33, T. 12 S., R. 5 E.; Kansas Falls USGS topographic quadrangle; lat. 38 degrees 57 minutes 53 seconds N. and long. 96 degrees 53 minutes 06 seconds W. (Colors are for dry soil unless otherwise indicated.)

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; common fine roots throughout; very slight effervescence; slightly alkaline; clear smooth boundary.

A—6 to 14 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; hard, friable, sticky and plastic; common very fine and fine roots throughout; slight effervescence; slightly alkaline; clear smooth boundary.
AC—14 to 30 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; hard, firm, sticky and plastic; common very fine roots throughout; strong effervescence; slightly alkaline; abrupt smooth boundary.
2C—30 to 72 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine tubular pores; strong effervescence; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 20 to 34 inches
Depth to the 2C horizon: 20 to 40 inches
Other features: The soil generally has free carbonates throughout; some pedons have a Bw horizon.

A horizon:
Hue—10YR
Value—3 or 4 dry, 2 or 3 moist
Chroma—2 or 3
Content of clay—30 to 40 percent (lower part)
Reaction—neutral or slightly alkaline

AC horizon:
Hue—10YR
Value—3 to 5 dry, 3 or 4 moist
Chroma—2 or 3
Texture—silty clay loam or silty clay
Content of clay—35 to 45 percent
Reaction—slightly alkaline or moderately alkaline

2C horizon:
Hue—10YR
Value—5 to 7 dry, 4 to 6 moist
Chroma—2 or 3
Texture—silt loam or very fine sandy loam
Content of clay—10 to 18 percent; thin strata of finer or coarser sediments are present in some pedons
Reaction—slightly alkaline or moderately alkaline

Sogn Series

The Sogn series consists of shallow and very shallow, somewhat excessively drained soils that formed in residuum derived from limestone. These soils are on uplands. Slopes range from 0 to 20 percent. The mean annual precipitation is about 32 inches, and the mean annual temperature is about 55 degrees F.

Taxonomic classification: Loamy, mixed, superactive, mesic Lithic Haplustolls

Typical Pedon

Sogn silty clay loam, in an area of rangeland about 10 miles east and 1 mile south of Junction City, in Geary County, Kansas; 300 feet east and 50 feet south of the northwest corner of sec. 15, T. 12 S., R. 7 E. (Colors are for dry soil unless otherwise indicated.)

A—0 to 9 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; moderate medium granular structure; hard, friable; few fragments of weathered limestone in the lower 3 inches comprise less than 15 percent of the soil volume; strong effervescence; moderately alkaline; abrupt smooth boundary.
R—9 inches; level-bedded indurated limestone that has joints averaging about 18 inches apart and less than 1/4 inch wide; cracks are filled with dark color soil.

Range in Characteristics

Soil moisture regime: Ustic bordering on Udic
Depth to lithic contact: 4 to 20 inches to limestone bedrock
Thickness of the mollic epipedon: 4 to 20 inches
Content of clay in the particle-size control section (weighted average): 20 to 35 percent
Content of sand in the particle-size control section (weighted average): 2 to 35 percent
Content of rock fragments in the particle-size control section (weighted average): Less than 35 percent
Size of rock fragments in the particle-size control section: Pebbles and channers
Kind of rock fragments in the particle-size control section: Limestone
Other features: Some pedons do not contain free carbonates above the bedrock; some pedons have an AC or C horizon with colors like the A horizon and texture of channery silt loam or channery silty clay loam.

A horizon:
Hue—7.5YR to 2.5Y
Value—3 to 5 dry, 2 or 3 moist
Chroma—1 to 3, dry or moist
Texture—silty clay loam, loam, silt loam, or clay loam
Content of clay—20 to 35 percent
Content of rock fragments—less than 35 percent
Reaction—slightly acid to moderately alkaline

Solomon Series

The Solomon series consists of very deep, poorly drained soils that formed in calcareous clayey alluvium. These nearly level soils are on flood plains and are subject to occasional flooding. They occur in the Central Kansas Sandstone Hills (MLRA 74), Central Loess Plains (MLRA 75), and the Bluestem Hills (MLRA 76). Permeability is very slow. Slopes range from 0 to 2 percent. The mean annual temperature is 55 degrees F, and the mean annual precipitation is 30 inches.

Taxonomic classification: Fine, smectitic, calcareous, mesic Vertic Epiaquolls

Typical Pedon

Solomon silty clay, in a cultivated field about 0.5 mile north and 0.5 mile west of Salina, in Saline County, Kansas; 1,000 feet north and 100 feet east of the southwest corner of sec. 35, T. 13 S., R. 3 W. (Colors are for moist soil unless otherwise indicated.)

Ap—0 to 4 inches; very dark gray (10YR 3/1) silty clay, dark gray (10YR 4/1) dry; strong fine granular structure; very hard, firm, sticky and plastic; many fine roots; strong effervescence; moderately alkaline; abrupt smooth boundary.
A—4 to 16 inches; black (10YR 2/1) silty clay, very dark gray (10YR 3/1) dry; moderate fine and medium blocky structure; extremely hard, very firm, sticky and plastic; common fine tubular roots throughout; few faint discontinuous pressure faces on horizontal faces of peds; few fine calcium carbonate concretions; strong effervescence; moderately alkaline; gradual smooth boundary.

Bg—16 to 32 inches; very dark gray (10YR 3/1) silty clay, dark gray (10YR 4/1) dry; weak medium and coarse blocky structure; extremely hard, very firm, very sticky and very plastic; few faint discontinuous pressure faces on horizontal faces of peds; few fine black (N 2/0) strongly cemented iron-manganese concretions; few fine calcium carbonate concretions; strong effervescence; moderately alkaline; diffuse smooth boundary.

BCg—32 to 50 inches; mixed very dark gray (10YR 3/1) and dark gray (10YR 4/1) silty clay, dark gray (10YR 4/l) and gray (10YR 5/1) dry; weak coarse blocky structure; extremely hard, very firm, very sticky and very plastic; common fine distinct brown (10YR 5/3) irregularly shaped masses of iron accumulation with diffuse boundaries throughout; few fine black (N 2/0) strongly cemented iron-manganese concretions; many fine calcium carbonate concretions; strong effervescence; moderately alkaline; diffuse smooth boundary.

Cg—50 to 65 inches; dark gray (10YR 4/1) silty clay, gray (10YR 5/1) dry; massive; very hard, very firm, very sticky and very plastic; many fine distinct brown (10YR 5/3) irregularly shaped masses of iron accumulation with diffuse boundaries throughout; few fine black (N 2/0) strongly cemented iron-manganese concretions; many fine calcium carbonate concretions; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 15 to more than 40 inches
Depth to free carbonates: Less than 10 inches
Content of clay in the particle-size control section (weighted average): 40 to 55 percent
Content of sand in the particle-size control section (weighted average): 2 to 15 percent

A horizon:
Hue—10YR or 2.5Y
Value—2 or 3 moist, 3 or 4 dry
Chroma—1 or 2
Texture—silty clay, clay, or silty clay loam
Reaction—slightly alkaline or moderately alkaline

Bg horizon:
Hue—10YR, 2.5Y, or 5Y
Value—2 to 4 moist, 3 to 5 dry
Chroma—1 or 2
Texture—silty clay
Reaction—moderately alkaline or strongly alkaline

Cg horizon:
Hue—10YR or 2.5Y
Value—3 to 5 moist, 4 to 6 dry
Chroma—1 or 2
Texture—silty clay or clay
Reaction—moderately alkaline or strongly alkaline

Sutphen Series

The Sutphen series consists of very deep, moderately well drained soils that formed in clayey alluvium. These soils are on flood plains and low terraces. Permeability is very slow. Slopes range from 0 to 2 percent. The mean annual temperature is about 54 degrees F, and the mean annual precipitation is about 32 inches.

Taxonomic classification: Fine, smectitic, mesic Udertic Haplustolls

Typical Pedon

Sutphen silty clay loam, in a nearly level cultivated field about 3 miles south and 6 miles west of Abilene, in Dickinson County, Kansas; 2,550 feet west and 100 feet north of the southeast corner of sec. 33, T. 13 S., R. 1 E. (Colors are for dry soil unless otherwise indicated.)

Ap—0 to 6 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; weak fine granular structure; hard, firm, sticky and plastic; common very fine roots; slightly acid; abrupt smooth boundary.

A1—6 to 13 inches; very dark gray (10YR 3/1) silty clay, black (10YR 2/1) moist; moderate medium subangular blocky structure; very hard, very firm, very sticky and very plastic; common very fine roots; neutral; clear wavy boundary.

A2—13 to 30 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; weak medium angular blocky structure; very hard, very firm, very sticky and very plastic; common very fine roots; a few slickensides; some old cracks filled with very dark gray (10YR 3/1) soil; slightly alkaline; gradual wavy boundary.

AC—30 to 46 inches; dark grayish brown (10YR 4/2) silty clay, very dark grayish brown (10YR 3/2) moist; weak medium angular blocky structure; very hard, very firm, very sticky and very plastic; a few slickensides; common fine carbonate concretions; moderately alkaline; gradual wavy boundary.

C1—46 to 57 inches; brown (10YR 5/3) silty clay, brown (10YR 4/3) moist; few fine faint (10YR 4/4) mottles; massive; hard, firm, very sticky and very plastic; a few slickensides; few medium and fine carbonate concretions; strong effervescence; moderately alkaline; gradual smooth boundary.

C2—57 to 60 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 4/3) moist; few fine faint (10YR 4/4) mottles; massive; hard, friable, slightly sticky and slightly plastic; few fine carbonate concretions; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 24 to 48 inches

Depth to free carbonates: 15 to 36 inches; any segregated carbonates at a depth of less than 28 inches are in the form of concretions.

Other features: Texture of the Ap horizon or the upper few inches of the A1 horizon is silty clay loam, silty clay, or clay.

A horizon:

Hue—10YR or 2.5Y
Value—3 to 5 dry, 2 or 3 moist
Chroma—1 or 2
Texture—silty clay or clay (lower part)
Reaction—slightly acid to moderately alkaline
Special features—faint mottles are below a depth of 20 inches in some pedons

C horizon:

Hue—10YR to 5Y
Value—5 to 7 dry, 4 to 6 moist
Chroma—2 to 4
Texture—silty clay or clay; silty clay loam below a depth of 40 inches in many pedons
Reaction—slightly alkaline or moderately alkaline

Tully Series

The Tully series consists of very deep, well drained soils that formed in clayey local alluvium or colluvium. These soils are on footslopes. Permeability is slow. Slopes range from 1 to 15 percent.

Taxonomic classification: Fine, mixed, superactive, mesic Pachic Argiustolls

Typical Pedon

Tully silty clay loam, in an area of grassland about 6 miles southeast of Manhattan, in Riley County, Kansas; 1,610 feet east and 2,340 feet north of the southwest corner of sec. 11, T. 11 S., R. 8 E. (Colors are for dry soil unless otherwise indicated.)

A—0 to 10 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; moderate fine and medium granular structure; hard, friable, sticky and plastic; many roots; few wormcasts; slightly acid; clear smooth boundary.

BA—10 to 16 inches; very dark grayish brown (10YR 3/2) silty clay loam, very dark brown (10YR 2/2) moist; moderate fine and very fine subangular blocky structure; very hard, firm, sticky and plastic; many fine roots throughout; few wormcasts; 2 to 5 percent gravel, by volume, mostly chert pebbles that are less than 1/2 inch in diameter; moderately acid; clear smooth boundary.

Bt1—16 to 28 inches; dark grayish brown (10YR 4/2) silty clay, very dark grayish brown (10YR 3/2) moist; moderate fine blocky structure; very hard, firm, very sticky and very plastic; many distinct clay films on faces of peds; common fine roots throughout; few fine black concretions; 2 to 5 percent gravel, by volume, mostly chert pebbles that are less than 1/2 inch in diameter; slightly acid; gradual smooth boundary.

Bt2—28 to 43 inches; grayish brown (10YR 5/2) silty clay, dark grayish brown (10YR 4/2) moist; few distinct faint yellowish brown (10YR 5/4) mottles; moderate medium blocky structure parting to weak fine and very fine blocky; very hard, firm, very sticky and very plastic; many distinct clay films on faces of peds; few fine roots throughout; few fine black concretions; 2 to 5 percent gravel, by volume, mostly chert pebbles less than one inch in diameter; slightly alkaline; gradual boundary.

BC—43 to 51 inches; brown (10YR 5/3) silty clay, brown (10YR 4/3) moist; few fine faint yellowish brown (10YR 5/4) mottles; weak fine blocky structure; very hard, firm, very sticky and very plastic; few fine black concretions; 2 to 5 percent chert pebbles less than 1/2 inch in diameter; slightly alkaline; gradual boundary.

C—51 to 72 inches; brown (7.5YR 4/4) silty clay, reddish brown (5YR 4/4) moist; few medium faint reddish brown (5YR 5/4) mottles; massive; very hard, firm, very sticky and very plastic; few fine black concretions; 2 to 5 percent gravel, by volume, mostly chert pebbles that are less than 1/2 inch in diameter; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 20 to more than 40 inches
Depth to free carbonates: 30 to more than 60 inches
Volume of chert or limestone fragments up to 3 inches across: As much as 35 percent, by volume

A horizon:
Hue—10YR or 7.5YR
Value—3 to 5 dry, 2 or 3 moist
Chroma—1 to 3
Texture—silt loam or silty clay loam, or their gravelly counterparts
Reaction—moderately acid to neutral

BA horizon:
Hue—10YR or 7.5YR
Value—3 to 5 dry, 2 or 3 moist
Chroma—1 to 3
Texture—silty clay loam or gravelly silty clay loam

Content of clay—27 to 40 percent
Reaction—moderately acid to neutral

Bt horizon:
Hue—10YR or 7.5YR
Value—4 to 6 dry, 3 to 5 moist
Chroma—2 to 4
Texture—silty clay loam, clay, or silty clay, or their gravelly counterparts
Content of clay—40 to 55 percent
Reaction—moderately acid to neutral (upper part); slightly acid to moderately alkaline (lower part)

C horizon:
Hue—10YR, 7.5YR, or 5YR
Value—4 to 6 dry, 3 to 5 moist
Chroma—2 to 6
Texture—silty clay, clay, or silty clay loam, or their gravelly counterparts
Reaction—neutral to moderately alkaline

Valentine Series

The Valentine series consists of very deep, excessively drained soils that formed in eolian sands. These soils are on uplands. Permeability is rapid. Slopes range from 0 to 60 percent. The mean annual temperature is about 51 degrees F, and the mean annual precipitation is about 20 inches.

Taxonomic classification: Mixed, mesic Typic Ustipsamments

Typical Pedon

Valentine fine sand, on a convex northwest-facing slope of 8 percent, in an area of rangeland about 12.5 miles north of Stapleton, in Logan County, Nebraska; 1,060 feet north and 530 feet west of the center of sec. 36, T. 20 N., R. 28 W. When described, the soil was moist throughout. (Colors are for dry soil unless otherwise indicated.)

A—0 to 5 inches; grayish brown (10YR 5/2) fine sand, dark grayish brown (10YR 4/2) moist; weak fine granular structure parting to single grained; loose; slightly acid; abrupt smooth boundary.
AC—5 to 9 inches; brown (10YR 5/3) fine sand, grayish brown (10YR 5/2) moist; weak, coarse prismatic structure parting to single grained; loose; slightly acid; clear smooth boundary.
C1—9 to 17 inches; pale brown (10YR 6/3) fine sand, pale brown (10YR 6/3) moist; weak coarse prismatic structure parting to single grained; loose; slightly acid; gradual smooth boundary.
C2—17 to 60 inches; very pale brown (10YR 7/3) fine sand, pale brown (10YR 6/3) moist, single grained, loose; neutral.

Range in Characteristics

Soil moisture regime: Ustic; the soil moisture control section is moist in some part from October through April, intermittently moist from May through June, and driest from July through September.

A horizon:
Hue—10YR
Value—4 to 6 dry, 3 to 5 moist
Chroma—2 or 3

Texture—fine sand, loamy fine sand, sand, or loamy sand
Reaction—moderately acid to neutral

AC horizon (if it occurs):
Hue—10YR
Value—5 to 7 dry, 4 to 6 moist
Chroma—2 or 3
Texture—fine sand or loamy fine sand; includes sand and loamy sand having less than 35 percent medium sand and less than 10 percent coarse or very coarse sand
Reaction—moderately acid to neutral

C horizon:
Hue—10YR
Value—6 or 7 dry, 5 or 6 moist
Chroma—2 to 4
Texture—fine sand or loamy fine sand; includes sand and loamy sand having less than 35 percent medium sand and less than 10 percent coarse or very coarse sand
Reaction—moderately acid to neutral
Special features—dark colored loamy textured strata ranging from 1/8 inch to 2 inches thick are below depths of 20 inches in some pedons

Wells Series

The Wells series consists of very deep, well drained soils that formed in residuum from noncalcareous sandstones and sandy shales modified by thin deposits of colluvium from sandstone and loess. These soils are on uplands. Permeability is moderate. Slopes range from 0 to 8 percent. The mean annual temperature is about 54 degrees F, and the mean annual precipitation is about 26 inches.

Taxonomic classification: Fine-loamy, mixed, active, mesic Udic Argiustolls

Typical Pedon

Wells loam, in an area of rangeland 1 mile south and 6 miles west of Minneapolis, in Ottawa County, Kansas; 300 feet west and 100 feet south of the northeast corner of sec. 13, T. 11 S., R. 5 W.; Tescott SE. USGS topographic quadrangle; lat. 39 degrees 06 minutes 10 seconds N. and long. 97 degrees 49 minutes 05 seconds W. (Colors are for dry soil unless otherwise indicated.)

A—0 to 10 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many fine roots, insect holes, wormcasts, and many fine tubular pores; moderately acid; gradual smooth boundary.
BA—10 to 16 inches; brown (7.5YR 4/2) clay loam, dark brown (7.5YR 3/2) moist; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine roots, many insect holes; many wormcasts; and many fine tubular pores; moderately acid; gradual smooth boundary.
Bt1—16 to 22 inches; mixed yellowish red (5YR 5/6) and reddish brown (5YR 4/4) clay loam, mixed yellowish red (5YR 4/6) and dark reddish brown (5YR 3/4) moist; moderate fine subangular blocky structure; hard, friable, sticky and plastic; clay films on vertical and horizontal faces of peds; many fine roots, many fine tubular pores, and few wormcasts; slightly acid; gradual smooth boundary.
Bt2—22 to 40 inches; reddish yellow (5YR 6/6) clay loam, yellowish red (5YR 4/6) moist; moderate fine and medium blocky structure; hard, firm, sticky and plastic;

common clay films on vertical faces of peds; few fine roots, few wormcasts, and many fine tubular pores; slightly acid; gradual smooth boundary.

Bt3—40 to 50 inches; reddish yellow (7.5YR 6/8) clay loam, strong brown (7.5YR 5/8) moist; moderate fine blocky structure; hard, friable, slightly sticky and slightly plastic; few clay films on vertical faces of peds; few fine roots, few wormcasts, and many fine tubular pores; slightly acid; gradual smooth boundary.

C—50 to 60 inches; reddish yellow (7.5YR 6/6) loam, strong brown (7.5YR 5/6) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; many fine and medium tubular pores; few fine iron concretions; neutral.

Range in Characteristics

Thickness of the mollic epipedon: 10 to 20 inches

A horizon:
- Hue—10YR or 7.5YR
- Value—4 or 5 dry, 2 or 3 moist
- Chroma—1 to 3
- Texture—loam, fine sandy loam, sandy loam, or clay loam
- Reaction—moderately acid or slightly acid

Bt horizon:
- Hue—7.5YR or 5YR
- Value—4 to 6 dry, 3 to 5 moist
- Chroma—3 to 6
- Texture—clay loam or sandy clay loam
- Reaction—slightly acid or neutral

C horizon:
- Hue—7.5YR or 5YR
- Value—4 to 7 dry, 5 or 6 moist
- Chroma—4 to 8
- Texture—clay loam, sandy clay loam, loam, or sandy loam
- Reaction—slightly acid to slightly alkaline
- Special features—calcium carbonate concretions in some pedons

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Glossary

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alkali (sodic) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Association, soil. A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bottom land. The normal flood plain of a stream, subject to flooding.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Climax plant community. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15 to 38 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Cobble (or cobblestone). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Colluvium. Soil material or rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Concretions. Cemented bodies with crude internal symmetry organized around a point, a line, or a plane. They typically take the form of concentric layers visible to the naked eye. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up concretions. If formed in place, concretions of iron oxide or manganese oxide are generally considered a type of redoximorphic concentration.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to compression. Terms describing consistence are defined in the "Soil Survey Manual."

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—*excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained,* and *very poorly drained*. These classes are defined in the "Soil Survey Manual."

Drainage, surface. Runoff, or surface flow of water, from an area.
Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.
Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.
Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.
Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as a fire, that exposes the surface.
Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grain is grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.
Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.
Fine textured soil. Sandy clay, silty clay, or clay.
Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.
Footslope. The position that forms the inner, gently inclined surface at the base of a hillslope. In profile, footslopes are commonly concave. A footslope is a transition zone between upslope sites of erosion and transport (shoulders and backslopes) and downslope sites of deposition (toeslopes).
Forb. Any herbaceous plant not a grass or a sedge.
Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.
Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.
Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.
Gravel. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.
Ground water. Water filling all the unblocked pores of the material below the water table.
Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.
Hard to reclaim (in tables). Reclamation is difficult after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.
Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the "Soil Survey Manual." The major horizons of mineral soil are as follows:
O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.
E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.
B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.
C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.
Cr horizon.—Soft, consolidated bedrock beneath the soil.
R layer.—Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

Hydrologic soil groups. Refers to soils grouped according to their runoff potential. The soil properties that influence this potential are those that affect the minimum rate of water infiltration on a bare soil during periods after prolonged wetting when the soil is not frozen. These properties are depth to a seasonal high water table, the infiltration rate and permeability after prolonged wetting, and depth to a very slowly permeable layer. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, plants invade following disturbance of the surface.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Descriptive terms are as follows: abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates

less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The movement of water through the soil.

Permeability. The quality of the soil that enables water or air to move downward through the profile. The rate at which a saturated soil transmits water is accepted as a measure of this quality. In soil physics, the rate is referred to as "saturated hydraulic conductivity," which is defined in the "Soil Survey Manual." In line with conventional usage in the engineering profession and with traditional usage in published soil surveys, this rate of flow continues to be expressed as "permeability." Terms describing permeability, measured in inches per hour, are as follows:

Impermeable	less than 0.0015 inch
Very slow	0.0015 to 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Range condition. The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor on the basis of how much the present plant community has departed from the potential.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid	less than 3.5
Extremely acid	3.5 to 4.4
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shrink-swell (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slick spot. A small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil generally is silty or clayey, is slippery when wet, and is low in productivity.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the material below the solum. The living roots and plant and animal activities are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to wind erosion and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field generally is built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material that is too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Upland. Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Tables

Table 1.--Temperature and Precipitation

(Recorded in the period 1965-87 at Milford, Kansas)

Month	Temperature						Precipitation				
				2 years in 10 will have--				2 years in 10 will have--			
	Avarage daily maximum	Average daily minimum	Average daily	Maximum temperature higher than--	Minimum temperature lower than--	Average number of growing degree days*	Average	Less than--	More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	35.3	14.0	24.7	67	11	0	0.70	0.13	1.14	2	6.3
February---	42.0	19.2	30.6	75	11	22	0.82	0.25	1.27	2	4.3
March------	54.6	30.1	42.4	83	6	49	2.37	0.69	3.75	4	1.3
April------	65.9	41.7	53.8	89	21	167	2.95	1.57	4.16	5	0.6
May--------	74.8	51.1	63.0	91	35	411	4.47	2.60	6.13	7	0.0
June-------	84.4	60.8	72.6	101	44	678	4.59	2.74	6.23	6	0.0
July-------	91.1	66.6	78.9	105	52	896	3.69	0.72	5.98	5	0.0
August-----	88.8	64.2	76.5	104	52	822	3.15	1.22	4.79	5	0.0
September--	80.3	55.2	67.8	99	35	534	4.03	1.69	6.01	5	0.0
October----	68.6	42.9	55.8	91	25	200	2.85	0.94	4.40	5	0.0
November---	53.3	31.3	42.3	78	11	12	1.53	0.22	2.52	3	0.0
December---	40.7	20.3	30.5	67	11	9	1.17	0.32	1.87	2	2.9
Yearly:											
Average---	65.0	41.5	53.2	----	---	---	---	---	---	---	---
Extreme---	---	---	---	107	11	---	---	---	---	---	---
Total-----	---	---	---	---	11	3,800	32.32	25.40	38.48	51	16.2

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40 degrees F).

Table 2.--Freeze Dates in Spring and Fall

(Recorded in the period 1965-87 at Milford, Kansas)

Probability	Temperature		
	24 °F or lower	28 °F or lower	32 °F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	Apr. 14	Apr. 19	May 1
2 years in 10 later than--	Apr. 8	Apr. 14	Apr. 27
5 years in 10 later than--	Mar. 27	Apr. 6	Apr. 18
First freezing temerature in fall:			
1 year in 10 earlier than--	Oct. 22	Oct. 11	Sept. 29
2 years in 10 earlier than--	Oct. 30	Oct. 16	Oct. 5
5 years in 10 earlier than--	Nov. 13	Oct. 27	Oct. 16

Table 3.--Growing Season

(Recorded in the period 1965-87 at Milford, Kansas)

Probability	Daily minimum temperature during growing season		
	Higher than 24 °F	Higher than 28 °F	Higher than 32 °F
	Days	Days	Days
9 years in 10	201	184	155
8 years in 10	211	190	164
5 years in 10	230	204	181
2 years in 10	248	217	198
1 year in 10	258	224	207

Table 4.--Acreage and Proportionate Extent of the Soils

Map symbol	Soil name	Acres	Percent
2177	McCook silt loam, occasionally flooded	1,127	0.4
2181	McCook-Smokyhill silt loams, occasionally flooded	3,473	1.3
2347	McCook silt loam, rarely flooded	1,140	0.4
3400	Longford loam, 1 to 3 percent slopes	1,678	0.6
3545	Hobbs silt loam, channeled	417	0.2
3561	Hobbs silt loam, occasionally flooded	2,119	0.8
3617	Solomon silty clay, occasionally flooded	830	0.3
3633	Sutphen silty clay, occasionally flooded	930	0.4
3775	Muir silt loam, rarely flooded	4,893	1.9
3827	Crete silty clay loam, 0 to 1 percent slopes	344	0.1
3828	Crete silty clay loam, 1 to 3 percent slopes	7,272	2.8
3830	Crete silty clay loam, 3 to 7 percent slopes	14,464	5.6
3844	Geary silt loam, 3 to 7 percent slopes	4,794	1.9
3845	Geary silt loam, 7 to 15 percent slopes	2,758	1.1
3880	Holder silt loam, 1 to 3 percent slopes	1,303	0.5
3882	Holder silt loam, 3 to 7 percent slopes	2,371	0.9
3890	Ladysmith silty clay loam, 0 to 1 percent slopes	4,947	1.9
3934	Valentine loamy fine sand, 5 to 15 percent slopes	472	0.2
3936	Wells-Ortello complex, 1 to 4 percent slopes	1,334	0.5
3938	Wells-Ortello complex, 4 to 8 percent slopes	3,919	1.5
4150	Kahola silt loam, channeled	2,123	0.8
4151	Kahola silt loam, occasionally flooded	8,456	3.3
4530	Benfield-Florence complex, 5 to 30 percent slopes	41,319	16.0
4550	Clime silty clay loam, 20 to 40 percent slopes, very stony	8,386	3.2
4590	Clime-Sogn complex, 3 to 20 percent slopes	49,355	19.1
4673	Irwin silty clay loam, 3 to 7 percent slopes	17,081	6.6
4735	Konza silty clay loam, 1 to 3 percent slopes	27,182	10.5
4781	Tully silty clay loam, 1 to 3 percent slopes	5,157	2.0
4783	Tully silty clay loam, 3 to 7 percent slopes	11,887	4.6
7031	Eudora silt loam, occasionally flooded	3,468	1.3
7081	Sarpy loamy fine sand, 0 to 4 percent slopes	574	0.2
7082	Sarpy gravelly loamy sand, occasionally flooded	314	0.1
7170	Reading silt loam, rarely flooded	47	*
7173	Reading silty clay loam, rarely flooded	7,105	2.7
7740	Haynie silt loam, frequently flooded	2,185	0.8
9971	Arents, earthen dam	100	*
9983	Gravel pits and quarries	391	0.2
9986	Miscellaneous water	32	*
9988	Orthents	555	0.2
9999	Water	12,309	4.8
	Total	258,611	100.0

* Less than 0.1 percent.

Table 5.--Land Capability and Yields per Acre of Crops

Yields are those that can be expected under a high level of management. They are for nonirrigated crops. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil.)

Map symbol and soil name	Land capability	Grain sorghum	Winter wheat
		Bu	Bu
2177:			
McCook	2w	61	36
2181:			
McCook	2w	61	36
Smokyhill	2w	64	34
2347:			
McCook	1	61	36
3400:			
Longford	2e	61	36
3561:			
Hobbs	2w	77	46
3617:			
Solomon	3w	45	22
3633:			
Sutphen	3w	61	36
3775:			
Muir	1	77	46
3827:			
Crete	2s	64	38
3828:			
Crete	2e	64	38
3830:			
Crete	3e	64	38
3844:			
Geary	3e	61	36
3880:			
Holder	2e	61	36
3882:			
Holder	3e	61	36
3890:			
Ladysmith	2s	60	36
3936:			
Wells	3e	64	38
Ortello	3e	60	30
3938:			
Wells	4e	58	34
Ortello	4e	56	26

Table 5.--Land Capability and Yields per Acre of Crops--Continued

Map symbol and soil name	Land capability	Grain sorghum	Winter wheat
		Bu	Bu
4151:			
Kahola	2w	77	46
4673:			
Irwin	4e	47	29
4735:			
Konza	3e	47	29
4781:			
Tully	2e	67	40
4783:			
Tully	3e	58	34
7031:			
Eudora	2w	70	39
7081:			
Sarpy	4s	39	20
7170:			
Reading	1	73	45
7173:			
Reading	1	72	44

Table 6.--Soil Rating for Plant Growth

(See text for an explanation of the ratings in this table.)

Map symbol	Soil name	Crop index
2177	McCook silt loam, occasionally flooded	63
2181	McCook-Smokyhill silt loams, occasionally flooded	62
2347	McCook silt loam, rarely flooded	65
3400	Longford loam, 1 to 3 percent slopes	76
3545	Hobbs silt loam, channeled	58
3561	Hobbs silt loam, occasionally flooded	73
3617	Solomon silty clay, occasionally flooded	41
3633	Sutphen silty clay, occasionally flooded	56
3775	Muir silt loam, rarely flooded	76
3827	Crete silty clay loam, 0 to 1 percent slopes	72
3828	Crete silty clay loam, 1 to 3 percent slopes	70
3830	Crete silty clay loam, 3 to 7 percent slopes	69
3844	Geary silt loam, 3 to 7 percent slopes	72
3845	Geary silt loam, 7 to 15 percent slopes	64
3880	Holder silt loam, 1 to 3 percent slopes	75
3882	Holder silt loam, 3 to 7 percent slopes	72
3890	Ladysmith silty clay loam, 0 to 1 percent slopes	67
3934	Valentine loamy fine sand, 5 to 15 percent slopes	36
3936	Wells-Ortello complex, 1 to 4 percent slopes	73
3938	Wells-Ortello complex, 4 to 8 percent slopes	71
4150	Kahola silt loam, channeled	61
4151	Kahola silt loam, occasionally flooded	75
4530	Benfield-Florence complex, 5 to 30 percent slopes	36
4550	Clime silty clay loam, 20 to 40 percent slopes, very stony	6
4590	Clime-Sogn complex, 3 to 20 percent slopes	25
4673	Irwin silty clay loam, 3 to 7 percent slopes	52
4735	Konza silty clay loam, 1 to 3 percent slopes	52
4781	Tully silty clay loam, 1 to 3 percent slopes	72
4783	Tully silty clay loam, 3 to 7 percent slopes	68
7031	Eudora silt loam, occasionally flooded	70
7081	Sarpy loamy fine sand, 0 to 4 percent slopes	32
7082	Sarpy gravelly loamy sand, occasionally flooded	24
7170	Reading silt loam, rarely flooded	78
7173	Reading silty clay loam, rarely flooded	79
7740	Haynie silt loam, frequently flooded	44
9971	Arents, earthen dam	1
9983	Gravel pits and quarries	0
9986	Miscellaneous water	0
9988	Orthents	1
9999	Water	0

Table 7.--Prime Farmland

(If a soil is prime farmland only under certain conditions, the conditions are specified in parentheses after the soil name.)

Map symbol	Soil name
2177	McCook silt loam, occasionally flooded
2181	McCook-Smokyhill silt loams, occasionally flooded
2347	McCook silt loam, rarely flooded
3400	Longford loam, 1 to 3 percent slopes
3561	Hobbs silt loam, occasionally flooded
3617	Solomon silty clay, occasionally flooded (where drained)
3633	Sutphen silty clay, occasionally flooded
3775	Muir silt loam, rarely flooded
3827	Crete silty clay loam, 0 to 1 percent slopes
3828	Crete silty clay loam, 1 to 3 percent slopes
3880	Holder silt loam, 1 to 3 percent slopes
3882	Holder silt loam, 3 to 7 percent slopes
3890	Ladysmith silty clay loam, 0 to 1 percent slopes
3936	Wells-Ortello complex, 1 to 4 percent slopes
4151	Kahola silt loam, occasionally flooded
4735	Konza silty clay loam, 1 to 3 percent slopes
4781	Tully silty clay loam, 1 to 3 percent slopes
7031	Eudora silt loam, occasionally flooded
7170	Reading silt loam, rarely flooded
7173	Reading silty clay loam, rarely flooded

Table 8.--Rangeland Productivity and Characteristic Plant Communities

(Only the soils that support rangeland vegetation suitable for grazing are rated.)

Map symbol and soil name	Ecological site	Total dry-weight production			Characteristic vegetation	Maximum rangeland composition
		Favorable year	Normal year	Unfavorable year		
		Lb/acre	Lb/acre	Lb/acre		Pct
2177:						
McCook	Loamy Lowland (pe25-34)	3,800	3,300	2,800	big bluestem	40
					eastern gamagrass	20
					yellow Indiangrass	15
					switchgrass	10
					prairie cordgrass	5
2181:						
McCook	Loamy Lowland (pe25-34)	3,800	3,300	2,800	big bluestem	40
					eastern gamagrass	20
					yellow Indiangrass	15
					switchgrass	10
					prairie cordgrass	5
Smokyhill	Clay Lowland (pe30-36)	7,500	5,500	3,500	prairie cordgrass	45
					big bluestem	10
					switchgrass	10
					eastern gamagrass	5
					yellow Indiangrass	5
2347:						
McCook	Loamy Lowland (pe25-34)	3,800	3,300	2,800	big bluestem	40
					eastern gamagrass	20
					yellow Indiangrass	15
					switchgrass	10
					prairie cordgrass	5
3400:						
Longford	Loamy Upland (pe25-34)	5,500	4,000	3,000	big bluestem	35
					little bluestem	20
					eastern gamagrass	10
					switchgrass	10
					yellow Indiangrass	10
3545:						
Hobbs	Loamy Lowland (pe25-34)	4,700	4,200	4,000	big bluestem	40
					eastern gamagrass	20
					yellow Indiangrass	15
					switchgrass	10
					prairie cordgrass	5
3561:						
Hobbs	Loamy Lowland (pe25-34)	4,700	4,200	4,000	big bluestem	40
					yellow Indiangrass	15
					switchgrass	15
					eastern gamagrass	15
					prairie cordgrass	10
					little bluestem	5
					common spikerush	5
					sideoats grama	5
					tall dropseed	5
					western wheatgrass	5
					buckbrush	2
					false indigo	2

Table 8.--Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Ecological site	Total dry-weight production			Characteristic vegetation	Maximum rangeland composition
		Favorable year	Normal year	Unfavorable year		
		Lb/acre	Lb/acre	Lb/acre		Pct
3617:						
Solomon--------	Clay Lowland (pe30-36)	8,500	6,000	3,500	prairie cordgrass----------	45
					big bluestem----------	10
					switchgrass----------	10
					eastern gamagrass----------	5
					yellow Indiangrass----------	5
3633:						
Sutphen--------	Clay Lowland (pe30-36)	7,500	5,500	3,500	prairie cordgrass----------	45
					big bluestem----------	10
					switchgrass----------	10
					eastern gamagrass----------	5
					yellow Indiangrass----------	5
3775:						
Muir-----------	Loamy Terrace (pe25-34)	7,500	5,500	4,000	big bluestem----------	35
					little bluestem----------	10
					switchgrass----------	10
					yellow Indiangrass----------	10
					Canada wildrye----------	5
					sideoats grama----------	5
					western wheatgrass----------	5
					compassplant----------	2
					daisy fleabane----------	2
					heath aster----------	2
					Illinois bundleflower--------	2
					pitcher sage----------	2
3827:						
Crete----------	Clay Upland (pe25-34)	4,500	4,100	3,700	big bluestem----------	30
					little bluestem----------	20
					switchgrass----------	15
					yellow Indiangrass----------	15
					western wheatgrass----------	10
					tall dropseed----------	5
3828:						
Crete----------	Clay Upland (pe25-34)	4,500	4,100	3,700	big bluestem----------	30
					little bluestem----------	20
					switchgrass----------	15
					yellow Indiangrass----------	15
					western wheatgrass----------	10
					tall dropseed----------	5
3830:						
Crete----------	Clay Upland (pe25-34)	4,500	4,100	3,700	big bluestem----------	30
					little bluestem----------	20
					switchgrass----------	15
					yellow Indiangrass----------	15
					western wheatgrass----------	10
					tall dropseed----------	5
3844:						
Geary----------	Loamy Upland (pe25-34)	6,000	4,000	3,000	big bluestem----------	35
					little bluestem----------	20
					eastern gamagrass----------	10
					switchgrass----------	10
					yellow Indiangrass----------	10

Table 8.--Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Ecological site	Total dry-weight production			Characteristic vegetation	Maximum rangeland composition
		Favorable year	Normal year	Unfavorable year		
		Lb/acre	Lb/acre	Lb/acre		Pct
3845:						
Geary	Loamy Upland (pe25-34)	6,000	4,000	3,000	big bluestem	35
					little bluestem	20
					eastern gamagrass	10
					switchgrass	10
					yellow Indiangrass	10
3880:						
Holder	Loamy Upland (pe25-34)	4,800	4,400	4,000	big bluestem	35
					little bluestem	20
					eastern gamagrass	10
					switchgrass	10
					yellow Indiangrass	10
3882:						
Holder	Loamy Upland (pe25-34)	4,800	4,400	4,000	big bluestem	35
					little bluestem	20
					eastern gamagrass	10
					switchgrass	10
					yellow Indiangrass	10
3890:						
Ladysmith	Clay Upland (pe30-36)	5,000	3,500	2,000	big bluestem	40
					little bluestem	25
					switchgrass	15
					yellow Indiangrass	15
					eastern gamagrass	5
					catclaw sensitive briar	3
					compassplant	3
					groundplum milkvetch	3
					Illinois bundleflower	3
					maximilian sunflower	3
					pitcher sage	3
					roundhead lespedeza	3
					tall dropseed	3
					wild licorice	3
3934:						
Valentine	Sandy (pe25-34)	3,000	2,600	2,200	sand bluestem	40
					little bluestem	20
					switchgrass	10
					blue grama	5
					porcupinegrass	5
					sideoats grama	5
					yellow Indiangrass	5
3936:						
Wells	Loamy Upland (pe25-34)	5,500	4,000	3,000	big bluestem	35
					little bluestem	20
					eastern gamagrass	10
					switchgrass	10
					yellow Indiangrass	10
Ortello	Sandy (pe25-34)	3,500	3,300	3,000	sand bluestem	40
					little bluestem	20
					switchgrass	10
					blue grama	5
					porcupinegrass	5
					sideoats grama	5
					yellow Indiangrass	5

Table 8.--Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Ecological site	Total dry-weight production			Characteristic vegetation	Maximum rangeland composition
		Favorable year	Normal year	Unfavorable year		
		Lb/acre	Lb/acre	Lb/acre		Pct
3938:						
Wells	Loamy Upland (pe25-34)	5,500	4,000	3,000	big bluestem	35
					little bluestem	20
					eastern gamagrass	10
					switchgrass	10
					yellow Indiangrass	10
Ortello	Sandy (pe25-34)	3,500	3,300	3,000	sand bluestem	40
					little bluestem	20
					switchgrass	10
					blue grama	5
					porcupinegrass	5
					sideoats grama	5
					yellow Indiangrass	5
4150:						
Kahola	Loamy Lowland (pe30-36)	10,000	8,000	6,000	big bluestem	40
					eastern gamagrass	20
					yellow Indiangrass	15
					switchgrass	10
					prairie cordgrass	5
4151:						
Kahola	Loamy Lowland (pe30-36)	10,000	8,000	6,000	big bluestem	40
					eastern gamagrass	20
					yellow Indiangrass	15
					switchgrass	10
					prairie cordgrass	5
4530:						
Benfield	Loamy Upland (pe30-36)	6,000	4,500	3,000	big bluestem	35
					little bluestem	20
					eastern gamagrass	10
					switchgrass	10
					yellow Indiangrass	10
Florence	Loamy Upland (pe30-36)	5,500	4,500	3,500	big bluestem	35
					little bluestem	20
					eastern gamagrass	10
					switchgrass	10
					yellow Indiangrass	10
4550:						
Clime	Limy Upland (pe30-36)	5,000	3,500	2,500	big bluestem	35
					little bluestem	20
					sideoats grama	10
					switchgrass	5
					yellow Indiangrass	5
4590:						
Clime	Limy Upland (pe30-36)	5,000	3,500	2,500	big bluestem	35
					little bluestem	20
					sideoats grama	10
					switchgrass	5
					yellow Indiangrass	5
Sogn	Shallow Limy (pe30-36)	3,500	2,500	1,500	big bluestem	25
					little bluestem	20
					sideoats grama	20
					yellow Indiangrass	10
					switchgrass	5

Table 8.--Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Ecological site	Total dry-weight production			Characteristic vegetation	Maximum rangeland composition
		Favorable year	Normal year	Unfavorable year		
		Lb/acre	Lb/acre	Lb/acre		Pct
4673:						
Irwin----------	Clay Upland (pe30-36)	5,000	3,500	2,000	big bluestem----------	30
					little bluestem----------	20
					switchgrass----------	15
					yellow Indiangrass----------	15
					tall dropseed----------	5
					blue grama----------	2
					leadplant----------	2
					prairie junegrass----------	2
					sideoats grama----------	2
					western wheatgrass----------	2
4735:						
Konza----------	Clay Pan (pe30-36)	4,000	3,000	2,000	big bluestem----------	15
					little bluestem----------	15
					sideoats grama----------	15
					switchgrass----------	15
					western wheatgrass----------	10
					tall dropseed----------	5
					yellow Indiangrass----------	5
4781:						
Tully----------	Loamy Upland (pe30-36)	6,000	5,000	3,500	big bluestem----------	35
					little bluestem----------	20
					eastern gamagrass----------	10
					switchgrass----------	10
					yellow Indiangrass----------	10
4783:						
Tully----------	Loamy Upland (pe30-36)	6,000	5,000	3,500	big bluestem----------	35
					little bluestem----------	20
					eastern gamagrass----------	10
					switchgrass----------	10
					yellow Indiangrass----------	10
7031:						
Eudora----------	Loamy Lowland (pe30-36)	10,000	8,000	6,000	big bluestem----------	40
					eastern gamagrass----------	20
					yellow Indiangrass----------	15
					switchgrass----------	10
					prairie cordgrass----------	5
7081:						
Sarpy----------	Sandy Lowland (pe30-36)	3,800	3,500	3,000	sand bluestem----------	30
					little bluestem----------	15
					switchgrass----------	10
					yellow Indiangrass----------	10
					eastern gamagrass----------	5
7082:						
Sarpy----------	Sandy Lowland (pe30-36)	3,800	3,500	3,000	sand bluestem----------	30
					little bluestem----------	15
					switchgrass----------	10
					yellow Indiangrass----------	10
					eastern gamagrass----------	5
7170:						
Reading--------	Loamy Lowland (pe30-36)	10,000	8,000	6,000	big bluestem----------	40
					eastern gamagrass----------	20
					yellow Indiangrass----------	15
					switchgrass----------	10
					prairie cordgrass----------	5

Table 8.--Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Ecological site	Total dry-weight production			Characteristic vegetation	Maximum rangeland composition
		Favorable year	Normal year	Unfavorable year		
		Lb/acre	Lb/acre	Lb/acre		Pct
7173:						
Reading--------	Loamy Lowland (pe30-36)	10,000	8,000	6,000	big bluestem----------	40
					eastern gamagrass----------	20
					yellow Indiangrass----------	15
					switchgrass----------	10
					prairie cordgrass----------	5
7740:						
Haynie---------	Loamy Lowland (pe30-36)	5,300	4,900	4,500	big bluestem----------	40
					eastern gamagrass----------	20
					yellow Indiangrass----------	15
					switchgrass----------	10
					prairie cordgrass----------	5

Table 9.--Windbreaks and Environmental Plantings

(Absence of an entry indicates that trees generally do not grow to the given height.)

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
2177:					
McCook----------	American hazelnut, chickasaw plum, golden currant, blackhaw, forsythia, gray dogwood, Nanking cherry, redosier dogwood, 'Konza" fragrant sumac, tamarisk.	American plum, amur privet, common lilac, Siberian peashrub, Tatarian honeysuckle, amur maple, 'Cardinal' autumn-olive, 'Elsberry' autumn-olive, common chokecherry.	Eastern redbud, oriental arborvitae, Washington hawthorn, blue spruce, eastern redcedar, osageorange, red mulberry, Russian mulberry, Russian olive, Siberian crabapple, white fir, white spruce, Douglas fir, Scotch pine, western soapberry.	Austrian pine, bitternut hickory, black walnut, bur oak, chinkapin oak, common hackberry, lacebark elm, northern catalpa, northern red oak, Norway maple, pin oak, shagbark hickory, shellbark hickory, sugar maple, white oak, American basswood, black cherry, black locust, black oak, black willow, golden willow, green ash, Kentucky coffeetree, Norway spruce, peachleaf willow, pecan, American sycamore, eastern white pine, honeylocust.	Siberian elm, silver maple, 'Nor'easter' eastern cottonwood, 'Ohio Red' eastern cottonwood, 'Mighty Mo' eastern cottonwood, 'Platte' eastern cottonwood.
2181:					
McCook----------	American hazelnut, chickasaw plum, golden currant, blackhaw, forsythia, gray dogwood, Nanking cherry, redosier dogwood, 'Konza' fragrant sumac, tamarisk.	American plum, amur privet, common lilac, Siberian peashrub, Tatarian honeysuckle, amur maple, 'Cardinal' autumn-olive, 'Elsberry' autumn-olive, common chokecherry.	Eastern redbud, oriental arborvitae, Washington hawthorn, blue spruce, eastern redcedar, osageorange, red mulberry, Russian mulberry, Russian olive, Siberian crabapple, white fir, white spruce, Douglas fir, Scotch pine, western soapberry.	Austrian pine, bitternut hickory, black walnut, bur oak, chinkapin oak, common hackberry, lacebark elm, northern catalpa, northern red oak, Norway maple, pin oak, shagbark hickory, shellbark hickory, sugar maple, white oak, American basswood, black cherry, black locust, black oak, black willow, golden willow, green ash, Kentucky coffeetree, Norway spruce, peachleaf willow, pecan, American sycamore, eastern white pine, honeylocust.	Siberian elm, silver maple, 'Nor'easter' eastern cottonwood, 'Ohio Red' eastern cottonwood, 'Mighty Mo' eastern cottonwood, 'Platte' eastern cottonwood.

Table 9.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
2181: Smokyhill	---	---	Eastern redcedar, Austrian pine, Scotch pine.	---	---
2347: McCook	American hazelnut, chickasaw plum, golden currant, blackhaw, forsythia, gray dogwood, Nanking cherry, redosier dogwood, 'Konza' fragrant sumac, tamarisk.	American plum, amur privet, common lilac, Siberian peashrub, Tatarian honeysuckle, amur maple, 'Cardinal' autumn-olive, 'Elsberry' autumn-olive, common chokecherry.	Eastern redbud, oriental arborvitae, Washington hawthorn, blue spruce, eastern redcedar, osageorange, red mulberry, Russian mulberry, Russian olive, Siberian crabapple, white fir, white spruce, Douglas fir, Scotch pine, western soapberry.	Austrian pine, bitternut hickory, black walnut, bur oak, chinkapin oak, common hackberry, lacebark elm, northern catalpa, northern red oak, Norway maple, pin oak, shagbark hickory, shellbark hickory, sugar maple, white oak, American basswood, black cherry, black locust, black oak, black willow, golden willow, green ash, Kentucky coffeetree, Norway spruce, peachleaf willow, pecan, American sycamore, eastern white pine, honeylocust.	Siberian elm, silver maple, 'Nor'easter' eastern cottonwood, 'Ohio Red' eastern cottonwood, 'Mighty Mo' eastern cottonwood, 'Platte' eastern cottonwood.
3400: Longford	American hazelnut, chickasaw plum, golden currant, Nanking cherry, American plum, blackhaw, common lilac, forsythia, gray dogwood, redosier dogwood, 'Konza' fragrant sumac, tamarisk, Tatarian honeysuckle.	Amur privet, common chokecherry, Siberian peashrub, amur maple, 'Cardinal' autumn-olive, 'Elsberry' autumn-olive.	Oriental arborvitae, Siberian crabapple, Washington hawthorn, eastern redcedar, osageorange, Russian olive, western soapberry, blue spruce, bur oak, chinkapin oak, common hackberry, Douglas fir, eastern white pine, red mulberry, Russian mulberry, white fir, white oak, white spruce.	Austrian pine, bitternut hickory, black locust, black oak, green ash, Kentucky coffeetree, lacebark elm, northern catalpa, northern red oak, Norway maple, Norway spruce, pecan, pin oak, sugar maple, American basswood, honeylocust, Scotch pine, silver maple.	Siberian elm.

Table 9.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
3545:					
Hobbs	American hazelnut, chickasaw plum, golden currant, blackhaw, forsythia, gray dogwood, Nanking cherry, redosier dogwood, 'Konza' fragrant sumac, tamarisk.	American plum, amur privet, common lilac, Siberian peashrub, Tatarian honeysuckle, amur maple, 'Cardinal' autumn-olive, 'Elsberry' autumn-olive, common chokecherry.	Eastern redbud, oriental arborvitae, Washington hawthorn, blue spruce, eastern redcedar, osageorange, red mulberry, Russian mulberry, Russian olive, Siberian crabapple, white fir, white spruce, Douglas fir, Scotch pine, western soapberry.	Austrian pine, bitternut hickory, black walnut, bur oak, chinkapin oak, common hackberry, lacebark elm, northern catalpa, northern red oak, Norway maple, pin oak, shagbark hickory, shellbark hickory, sugar maple, white oak, American basswood, black cherry, black locust, black oak, black willow, golden willow, green ash, Kentucky coffeetree, Norway spruce, peachleaf willow, pecan, American sycamore, eastern white pine, honeylocust.	Siberian elm, silver maple, 'Nor'easter' eastern cottonwood, 'Ohio Red' eastern cottonwood, 'Mighty Mo' eastern cottonwood, 'Platte' eastern cottonwood.
3561:					
Hobbs	American hazelnut, chickasaw plum, golden currant, blackhaw, forsythia, gray dogwood, Nanking cherry, redosier dogwood, 'Konza' fragrant sumac, tamarisk.	American plum, amur privet, common lilac, Siberian peashrub, Tatarian honeysuckle, amur maple, 'Cardinal' autumn-olive, 'Elsberry' autumn-olive, common chokecherry.	Eastern redbud, oriental arborvitae, Washington hawthorn, blue spruce, eastern redcedar, osageorange, red mulberry, Russian mulberry, Russian olive, Siberian crabapple, white fir, white spruce, Douglas fir, Scotch pine, western soapberry.	Austrian pine, bitternut hickory, black walnut, bur oak, chinkapin oak, common hackberry, lacebark elm, northern catalpa, northern red oak, Norway maple, pin oak, shagbark hickory, shellbark hickory, sugar maple, white oak, American basswood, black cherry, black locust, black oak, black willow, golden willow, green ash, Kentucky coffeetree, Norway spruce, peachleaf willow, pecan, American sycamore, eastern white pine, honeylocust.	Siberian elm, silver maple, 'Nor'easter' eastern cottonwood, 'Ohio Red' eastern cottonwood, 'Mighty Mo' eastern cottonwood, 'Platte' eastern cottonwood.

Table 9.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
3617: Solomon	Golden currant, American plum, blackhaw, forsythia, gray dogwood, redosier dogwood, Siberian peashrub, 'Konza' fragrant sumac, tamarisk.	Amur privet, 'Cardinal' autumn-olive, 'Elsberry' autumn-olive, common chokecherry, common lilac, Tatarian honeysuckle, amur maple.	Eastern redbud, oriental arborvitae, Siberian crabapple, Washington hawthorn, osageorange, white fir, common hackberry, Douglas fir, eastern redcedar, western soapberry.	American basswood, Austrian pine, blue spruce, bur oak, Kentucky coffeetree, lacebark elm, Norway spruce, pin oak, red mulberry, Russian mulberry, Scotch pine, white spruce, bitternut hickory, black locust, black willow, golden willow, green ash, northern catalpa, northern red oak, peachleaf willow, pecan, shellbark hickory, American sycamore, eastern white pine, honeylocust.	Siberian elm, silver maple, 'Nor'easter' eastern cottonwood, 'Ohio Red' eastern cottonwood, 'Mighty Mo' eastern cottonwood, 'Platte' eastern cottonwood.
3633: Sutphen	American hazelnut, common lilac, Siberian peashrub, tamarisk, Tatarian honeysuckle.	'Cardinal' autumn-olive, eastern redcedar, Siberian crabapple.	Common hackberry, green ash, osageorange, pin oak, red mulberry, Russian mulberry, Russian olive, western soapberry, Austrian pine, bitternut hickory, black locust, chinkapin oak, honeylocust, white oak, black oak, northern catalpa.	Siberian elm	---

Table 9.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
3775:					
Muir	American hazelnut, chickasaw plum, golden currant, blackhaw, forsythia, gray dogwood, Nanking cherry, redosier dogwood, 'Konza' fragrant sumac, tamarisk.	American plum, amur privet, common lilac, Siberian peashrub, Tatarian honeysuckle, amur maple, 'Cardinal' autumn-olive, 'Elsberry' autumn-olive, common chokecherry.	Eastern redbud, oriental arborvitae, Washington hawthorn, blue spruce, eastern redcedar, osageorange, red mulberry, Russian mulberry, Russian olive, Siberian crabapple, white fir, white spruce, Douglas fir, Scotch pine, western soapberry.	Austrian pine, bitternut hickory, black walnut, bur oak, chinkapin oak, common hackberry, lacebark elm, northern catalpa, northern red oak, Norway maple, pin oak, shagbark hickory, shellbark hickory, sugar maple, white oak, American basswood, black cherry, black locust, black oak, black willow, golden willow, green ash, Kentucky coffeetree, Norway spruce, peachleaf willow, pecan, American sycamore, eastern white pine, honeylocust.	Siberian elm, silver maple, 'Nor'easter' eastern cottonwood, 'Ohio Red' eastern cottonwood, 'Mighty Mo' eastern cottonwood, 'Platte' eastern cottonwood.
3827:					
Crete	American hazelnut, common lilac, Siberian peashrub, tamarisk, Tatarian honeysuckle.	'Cardinal' autumn-olive, eastern redcedar, Siberian crabapple.	Common hackberry, green ash, osageorange, pin oak, red mulberry, Russian mulberry, Russian olive, western soapberry, Austrian pine, bitternut hickory, black locust, chinkapin oak, honeylocust, white oak, black oak, northern catalpa.	Siberian elm------	---

Table 9.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
3828:					
Crete	American hazelnut, common lilac, Siberian peashrub, tamarisk, Tatarian honeysuckle.	'Cardinal' autumn-olive, eastern redcedar, Siberian crabapple.	Common hackberry, green ash, osageorange, pin oak, red mulberry, Russian mulberry, Russian olive, western soapberry, Austrian pine, bitternut hickory, black locust, chinkapin oak, honeylocust, white oak, black oak, northern catalpa.	Siberian elm	---
3830:					
Crete	American hazelnut, common lilac, Siberian peashrub, tamarisk, Tatarian honeysuckle.	'Cardinal' autumn-olive, eastern redcedar, Siberian crabapple.	Common hackberry, green ash, osageorange, pin oak, red mulberry, Russian mulberry, Russian olive, western soapberry, Austrian pine, bitternut hickory, black locust, chinkapin oak, honeylocust, white oak, black oak, northern catalpa.	Siberian elm	---
3844:					
Geary	American hazelnut, chickasaw plum, golden currant, Nanking cherry, American plum, blackhaw, common lilac, forsythia, gray dogwood, redosier dogwood, 'Konza' fragrant sumac, tamarisk, Tatarian honeysuckle.	Amur privet, common chokecherry, Siberian peashrub, amur maple, 'Cardinal' autumn-olive, 'Elsberry' autumn-olive.	Oriental arborvitae, Siberian crabapple, Washington hawthorn, eastern redcedar, osageorange, Russian olive, western soapberry, blue spruce, bur oak, chinkapin oak, common hackberry, Douglas fir, eastern white pine, red mulberry, Russian mulberry, white fir, white oak, white spruce.	Austrian pine, bitternut hickory, black locust, black oak, green ash, Kentucky coffeetree, lacebark elm, northern catalpa, northern red oak, Norway maple, Norway spruce, pecan, pin oak, sugar maple, American basswood, honeylocust, Scotch pine, silver maple.	Siberian elm.

Table 9.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
3845:					
Geary	American hazelnut, chickasaw plum, golden currant, Nanking cherry, American plum, blackhaw, common lilac, forsythia, gray dogwood, redosier dogwood, 'Konza' fragrant sumac, tamarisk, Tatarian honeysuckle.	Amur privet, common chokecherry, Siberian peashrub, amur maple, 'Cardinal' autumn-olive, 'Elsberry' autumn-olive.	Oriental arborvitae, Siberian crabapple, Washington hawthorn, eastern redcedar, osageorange, Russian olive, western soapberry, blue spruce, bur oak, chinkapin oak, common hackberry, Douglas fir, eastern white pine, red mulberry, Russian mulberry, white fir, white oak, white spruce.	Austrian pine, bitternut hickory, black locust, black oak, green ash, Kentucky coffeetree, lacebark elm, northern catalpa, northern red oak, Norway maple, Norway spruce, pecan, pin oak, sugar maple, American basswood, honeylocust, Scotch pine, silver maple.	Siberian elm.
3880:					
Holder	American hazelnut, chickasaw plum, golden currant, Nanking cherry, American plum, blackhaw, common lilac, forsythia, gray dogwood, redosier dogwood, 'Konza' fragrant sumac, tamarisk, Tatarian honeysuckle.	Amur privet, common chokecherry, Siberian peashrub, amur maple, 'Cardinal' autumn-olive, 'Elsberry' autumn-olive.	Oriental arborvitae, Siberian crabapple, Washington hawthorn, eastern redcedar, osageorange, Russian olive, western soapberry, blue spruce, bur oak, chinkapin oak, common hackberry, Douglas fir, eastern white pine, red mulberry, Russian mulberry, white fir, white oak, white spruce.	Austrian pine, bitternut hickory, black locust, black oak, green ash, Kentucky coffeetree, lacebark elm, northern catalpa, northern red oak, Norway maple, Norway spruce, pecan, pin oak, sugar maple, American basswood, honeylocust, Scotch pine, silver maple.	Siberian elm.

Table 9.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
3882: Holder	American hazelnut, chickasaw plum, golden currant, Nanking cherry, American plum, blackhaw, common lilac, forsythia, gray dogwood, redosier dogwood, 'Konza' fragrant sumac, tamarisk, Tatarian honeysuckle.	Amur privet, common chokecherry, Siberian peashrub, amur maple, 'Cardinal' autumn-olive, 'Elsberry' autumn-olive.	Oriental arborvitae, Siberian crabapple, Washington hawthorn, eastern redcedar, osageorange, Russian olive, western soapberry, blue spruce, bur oak, chinkapin oak, common hackberry, Douglas fir, eastern white pine, red mulberry, Russian mulberry, white fir, white oak, white spruce.	Austrian pine, bitternut hickory, black locust, black oak, green ash, Kentucky coffeetree, lacebark elm, northern catalpa, northern red oak, Norway maple, Norway spruce, pecan, pin oak, sugar maple, American basswood, honeylocust, Scotch pine, silver maple.	Siberian elm.
3890: Ladysmith	American hazelnut, common lilac, Siberian peashrub, tamarisk, Tatarian honeysuckle.	'Cardinal' autumn-olive, eastern redcedar, Siberian crabapple.	Common hackberry, green ash, osageorange, pin oak, red mulberry, Russian mulberry, Russian olive, western soapberry, Austrian pine, bitternut hickory, black locust, chinkapin oak, honeylocust, white oak, black oak, northern catalpa.	Siberian elm------	---
3934: Valentine	---	---	Eastern redcedar, Austrian pine, Scotch pine.	---	---

Table 9.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
3936:					
Wells	American hazelnut, chickasaw plum, golden currant, Nanking cherry, American plum, blackhaw, common lilac, forsythia, gray dogwood, redosier dogwood, 'Konza' fragrant sumac, tamarisk, Tatarian honeysuckle.	Amur privet, common chokecherry, Siberian peashrub, amur maple, 'Cardinal' autumn-olive, 'Elsberry' autumn-olive.	Oriental arborvitae, Siberian crabapple, Washington hawthorn, eastern redcedar, osageorange, Russian olive, western soapberry, blue spruce, bur oak, chinkapin oak, common hackberry, Douglas fir, eastern white pine, red mulberry, Russian mulberry, white fir, white oak, white spruce.	Austrian pine, bitternut hickory, black locust, black oak, green ash, Kentucky coffeetree, lacebark elm, northern catalpa, northern red oak, Norway maple, Norway spruce, pecan, pin oak, sugar maple, American basswood, honeylocust, Scotch pine, silver maple.	Siberian elm.
Ortello	Chickasaw plum, golden currant, Nanking cherry, American plum, blackhaw, common lilac, forsythia, sumac, fragrant 'Konza', tamarisk, Tatarian honeysuckle.	Amur maple, amur privet, common chokecherry, Siberian peashrub, 'Cardinal' autumn-olive, 'Elsberry' autumn-olive.	Oriental arborvitae, Russian olive, Siberian crabapple, Washington hawthorn, eastern redcedar, osageorange, red mulberry, Russian mulberry, western soapberry, bur oak, common hackberry.	Austrian pine, black locust, green ash, Kentucky coffeetree, lacebark elm, northern catalpa, Scotch pine, American basswood, eastern white pine, honeylocust, Siberian elm.	---
3938:					
Wells	American hazelnut, chickasaw plum, golden currant, Nanking cherry, American plum, blackhaw, common lilac, forsythia, gray dogwood, redosier dogwood, 'Konza' fragrant sumac, tamarisk, Tatarian honeysuckle.	Amur privet, common chokecherry, Siberian peashrub, amur maple, 'Cardinal' autumn-olive, 'Elsberry' autumn-olive.	Oriental arborvitae, Siberian crabapple, Washington hawthorn, eastern redcedar, osageorange, Russian olive, western soapberry, blue spruce, bur oak, chinkapin oak, common hackberry, Douglas fir, eastern white pine, red mulberry, Russian mulberry, white fir, white oak, white spruce.	Austrian pine, bitternut hickory, black locust, black oak, green ash, Kentucky coffeetree, lacebark elm, northern catalpa, northern red oak, Norway maple, Norway spruce, pecan, pin oak, sugar maple, American basswood, honeylocust, Scotch pine, silver maple.	Siberian elm.

Table 9.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
3938:					
Ortello	Chickasaw plum, golden currant, Nanking cherry, American plum, blackhaw, common lilac, forsythia, 'Konza' fragrant sumac, tamarisk, Tatarian honeysuckle.	Amur maple, amur privet, common chokecherry, Siberian peashrub, 'Cardinal' autumn-olive, 'Elsberry' autumn-olive.	Oriental arborvitae, Russian olive, Siberian crabapple, Washington hawthorn, eastern redcedar, osageorange, red mulberry, Russian mulberry, western soapberry, bur oak, common hackberry.	Austrian pine, black locust, green ash, Kentucky coffeetree, lacebark elm, northern catalpa, Scotch pine, American basswood, eastern white pine, honeylocust, Siberian elm.	---
4150:					
Kahola	American hazelnut, chickasaw plum, golden currant, blackhaw, forsythia, gray dogwood, Nanking cherry, redosier dogwood, 'Konza' fragrant sumac, tamarisk.	American plum, amur privet, common lilac, Siberian peashrub, Tatarian honeysuckle, amur maple, 'Cardinal' autumn-olive, 'Elsberry' autumn-olive, common chokecherry.	Eastern redbud, oriental arborvitae, Washington hawthorn, blue spruce, eastern redcedar, osageorange, red mulberry, Russian mulberry, Russian olive, Siberian crabapple, white fir, white spruce, Douglas fir, Scotch pine, western soapberry.	Austrian pine, bitternut hickory, black walnut, bur oak, chinkapin oak, common hackberry, lacebark elm, northern catalpa, northern red oak, Norway maple, pin oak, shagbark hickory, shellbark hickory, sugar maple, white oak, American basswood, black cherry, black locust, black oak, black willow, golden willow, green ash, Kentucky coffeetree, Norway spruce, peachleaf willow, pecan, American sycamore, eastern white pine, honeylocust.	Siberian elm, silver maple, 'Nor'easter' eastern cottonwood, 'Ohio Red' eastern cottonwood, 'Mighty Mo' eastern cottonwood, 'Platte' eastern cottonwood.

Table 9.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
4151:					
Kahola----------	American hazelnut, chickasaw plum, golden currant, blackhaw, forsythia, gray dogwood, Nanking cherry, redosier dogwood, 'Konza' fragrant sumac, tamarisk.	American plum, amur privet, common lilac, Siberian peashrub, Tatarian honeysuckle, amur maple, 'Cardinal' autumn-olive, 'Elsberry' autumn-olive, common chokecherry.	Eastern redbud, oriental arborvitae, Washington hawthorn, blue spruce, eastern redcedar, osageorange, red mulberry, Russian mulberry, Russian olive, Siberian crabapple, white fir, white spruce, Douglas fir, Scotch pine, western soapberry.	Austrian pine, bitternut hickory, black walnut, bur oak, chinkapin oak, common hackberry, lacebark elm, northern catalpa, northern red oak, Norway maple, pin oak, shagbark hickory, shellbark hickory, sugar maple, white oak, American basswood, black cherry, black locust, black oak, black willow, golden willow, green ash, Kentucky coffeetree, Norway spruce, peachleaf willow, pecan, American sycamore, eastern white pine, honeylocust.	Siberian elm, silver maple, 'Nor'easter' eastern cottonwood, 'Ohio Red' eastern cottonwood, 'Mighty Mo' eastern cottonwood, 'Platte' eastern cottonwood.
4530:					
Benfield--------	American hazelnut, common lilac, Siberian peashrub, tamarisk, Tatarian honeysuckle.	'Cardinal' autumn-olive, eastern redcedar, Siberian crabapple.	Common hackberry, green ash, osageorange, pin oak, red mulberry, Russian mulberry, Russian olive, western soapberry, Austrian pine, bitternut hickory, black locust, chinkapin oak, honeylocust, white oak, black oak, northern catalpa.	Siberian elm------	---

Table 9.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
4530: Florence	American hazelnut, golden currant, common lilac, Siberian peashrub, 'Konza' fragrant sumac, tamarisk.	'Cardinal' autumn-olive, 'Elsberry' autumn-olive, Tatarian honeysuckle, eastern redcedar, Siberian crabapple.	Common hackberry, green ash, osageorange, Russian mulberry, Russian olive, western soapberry, Austrian pine, bitternut hickory, bur oak, chinkapin oak, honeylocust, red mulberry, black locust, black oak, northern catalpa, sugar maple, white oak.	Norway maple, Siberian elm.	---
4550: Clime	Siberian peashrub, 'Konza' fragrant sumac, tamarisk, Tatarian honeysuckle.	---	Eastern redcedar, green ash, osageorange, Russian mulberry, Russian olive, black locust, honeylocust, black oak, northern catalpa.	Chinkapin oak, Siberian elm.	---
4590: Clime	Siberian peashrub, 'Konza' fragrant sumac, tamarisk, Tatarian honeysuckle.	---	Eastern redcedar, green ash, osageorange, Russian mulberry, Russian olive, black locust, honeylocust, black oak, northern catalpa.	Chinkapin oak, Siberian elm.	---
Sogn.					
4673: Irwin	American hazelnut, common lilac, Siberian peashrub, tamarisk, Tatarian honeysuckle.	'Cardinal' autumn-olive, eastern redcedar, Siberian crabapple.	Common hackberry, green ash, osageorange, pin oak, red mulberry, Russian mulberry, Russian olive, western soapberry, Austrian pine, bitternut hickory, black locust, chinkapin oak, honeylocust, white oak, black oak, northern catalpa.	Siberian elm------	---

Table 9.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
4735:					
Konza	American hazelnut, common lilac, Siberian peashrub, tamarisk, Tatarian honeysuckle.	'Cardinal' autumn-olive, eastern redcedar, Siberian crabapple.	Common hackberry, green ash, osageorange, pin oak, red mulberry, Russian mulberry, Russian olive, western soapberry, Austrian pine, bitternut hickory, black locust, chinkapin oak, honeylocust, white oak, black oak, northern catalpa.	Siberian elm	---
4781:					
Tully	American hazelnut, chickasaw plum, golden currant, Nanking cherry, American plum, blackhaw, common lilac, forsythia, gray dogwood, redosier dogwood, 'Konza' fragrant sumac, tamarisk, Tatarian honeysuckle.	Amur privet, common chokecherry, Siberian peashrub, amur maple, 'Cardinal' autumn-olive, 'Elsberry' autumn-olive.	Oriental arborvitae, Siberian crabapple, Washington hawthorn, eastern redcedar, osageorange, Russian olive, western soapberry, blue spruce, bur oak, chinkapin oak, common hackberry, Douglas fir, eastern white pine, red mulberry, Russian mulberry, white fir, white oak, white spruce.	Austrian pine, bitternut hickory, black locust, black oak, green ash, Kentucky coffeetree, lacebark elm, northern catalpa, northern red oak, Norway maple, Norway spruce, pecan, pin oak, sugar maple, American basswood, honeylocust, Scotch pine, silver maple.	Siberian elm.
4783:					
Tully	American hazelnut, chickasaw plum, golden currant, Nanking cherry, American plum, blackhaw, common lilac, forsythia, gray dogwood, redosier dogwood, 'Konza' fragrant sumac, tamarisk, Tatarian honeysuckle.	Amur privet, common chokecherry, Siberian peashrub, amur maple, 'Cardinal' autumn-olive, 'Elsberry' autumn-olive.	Oriental arborvitae, Siberian crabapple, Washington hawthorn, eastern redcedar, osageorange, Russian olive, western soapberry, blue spruce, bur oak, chinkapin oak, common hackberry, Douglas fir, eastern white pine, red mulberry, Russian mulberry, white fir, white oak, white spruce.	Austrian pine, bitternut hickory, black locust, black oak, green ash, Kentucky coffeetree, lacebark elm, northern catalpa, northern red oak, Norway maple, Norway spruce, pecan, pin oak, sugar maple, American basswood, honeylocust, Scotch pine, silver maple.	Siberian elm.

Table 9.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
7031: Eudora	American hazelnut, chickasaw plum, golden currant, blackhaw, forsythia, gray dogwood, Nanking cherry, redosier dogwood, 'Konza' fragrant sumac, tamarisk.	American plum, amur privet, common lilac, Siberian peashrub, Tatarian honeysuckle, amur maple, 'Cardinal' autumn-olive, 'Elsberry' autumn-olive, common chokecherry.	Eastern redbud, oriental arborvitae, Washington hawthorn, blue spruce, eastern redcedar, osageorange, red mulberry, Russian mulberry, Russian olive, Siberian crabapple, white fir, white spruce, Douglas fir, Scotch pine, western soapberry.	Austrian pine, bitternut hickory, black walnut, bur oak, chinkapin oak, common hackberry, lacebark elm, northern catalpa, northern red oak, Norway maple, pin oak, shagbark hickory, shellbark hickory, sugar maple, white oak, American basswood, black cherry, black locust, black oak, black willow, golden willow, green ash, Kentucky coffeetree, Norway spruce, peachleaf willow, pecan, American sycamore, eastern white pine, honeylocust.	Siberian elm, silver maple, 'Nor'easter' eastern cottonwood, 'Ohio Red' eastern cottonwood, 'Mighty Mo' eastern cottonwood, 'Platte' eastern cottonwood.
7081: Sarpy	Blackhaw, 'Konza' fragrant sumac.	American plum, common lilac, Siberian peashrub, Tatarian honeysuckle, common chokecherry.	Eastern redbud, oriental arborvitae, Washington hawthorn, eastern redcedar, osageorange, red mulberry, Russian mulberry, Russian olive.	Black walnut, bur oak, common hackberry, northern catalpa, black locust, black willow, golden willow, green ash, American sycamore, honeylocust.	Siberian elm.
7082: Sarpy.					

Table 9.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
7170:					
Reading---	American hazelnut, chickasaw plum, golden currant, blackhaw, forsythia, gray dogwood, Nanking cherry, redosier dogwood, 'Konza' fragrant sumac, tamarisk.	American plum, amur privet, common lilac, Siberian peashrub, Tatarian honeysuckle, amur maple, 'Cardinal' autumn-olive, 'Elsberry' autumn-olive, common chokecherry.	Eastern redbud, oriental arborvitae, Washington hawthorn, blue spruce, eastern redcedar, osageorange, red mulberry, Russian mulberry, Russian olive, Siberian crabapple, white fir, white spruce, Douglas fir, Scotch pine, western soapberry.	Austrian pine, bitternut hickory, black walnut, bur oak, chinkapin oak, common hackberry, lacebark elm, northern catalpa, northern red oak, Norway maple, pin oak, shagbark hickory, shellbark hickory, sugar maple, white oak, American basswood, black cherry, black locust, black oak, black willow, golden willow, green ash, Kentucky coffeetree, Norway spruce, peachleaf willow, pecan, American sycamore, eastern white pine, honeylocust.	Siberian elm, silver maple, 'Nor'easter' eastern cottonwood, 'Ohio Red' eastern cottonwood, 'Mighty Mo' eastern cottonwood, 'Platte' eastern cottonwood.
7173:					
Reading---	American hazelnut, chickasaw plum, golden currant, blackhaw, forsythia, gray dogwood, Nanking cherry, redosier dogwood, 'Konza' fragrant sumac, tamarisk.	American plum, amur privet, common lilac, Siberian peashrub, Tatarian honeysuckle, amur maple, 'Cardinal' autumn-olive, 'Elsberry' autumn-olive, common chokecherry.	Eastern redbud, oriental arborvitae, Washington hawthorn, blue spruce, eastern redcedar, osageorange, red mulberry, Russian mulberry, Russian olive, Siberian crabapple, white fir, white spruce, Douglas fir, Scotch pine, western soapberry.	Austrian pine, bitternut hickory, black walnut, bur oak, chinkapin oak, common hackberry, lacebark elm, northern catalpa, northern red oak, Norway maple, pin oak, shagbark hickory, shellbark hickory, sugar maple, white oak, American basswood, black cherry, black locust, black oak, black willow, golden willow, green ash, Kentucky coffeetree, Norway spruce, peachleaf willow, pecan, American sycamore, eastern white pine, honeylocust.	Siberian elm, silver maple, 'Nor'easter' eastern cottonwood, 'Ohio Red' eastern cottonwood, 'Mighty Mo' eastern cottonwood, 'Platte' eastern cottonwood.

Table 9.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
7740: Haynie	Blackhaw, 'Konza' fragrant sumac.	American plum, common lilac, Siberian peashrub, Tatarian honeysuckle, common chokecherry.	Eastern redbud, oriental arborvitae, Washington hawthorn, eastern redcedar, osageorange, red mulberry, Russian mulberry, Russian olive.	Black walnut, bur oak, common hackberry, northern catalpa, black locust, black willow, golden willow, green ash, American sycamore, honeylocust.	Siberian elm.

Table 10.--Recreation

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. See text for definitions of terms used in this table.)

Map symbol and soil name	Pct. of map unit	Camp areas	Picnic areas	Playgrounds	Paths and trails	Off-road motorcycle trails	Golf fairways
2177:							
McCook-------	85	Very limited: Flooding	Not limited	Somewhat limited: Flooding	Not limited	Not limited	Somewhat limited: Flooding
2181:							
McCook-------	68	Very limited: Flooding	Not limited	Somewhat limited: Flooding	Not limited	Not limited	Somewhat limited: Flooding
Smokyhill----	25	Very limited: Flooding, Ponding, Restricted permeability	Very limited: Ponding, Restricted permeability	Very limited: Ponding, Flooding, Restricted permeability	Very limited: Ponding	Very limited: Ponding	Very limited: Ponding, Flooding
2347:							
McCook-------	85	Very limited: Flooding	Not limited	Not limited	Not limited	Not limited	Not limited
3400:							
Longford-----	85	Somewhat limited: Restricted permeability	Somewhat limited: Restricted permeability	Somewhat limited: Restricted permeability	Not limited	Not limited	Not limited
3545:							
Hobbs--------	94	Very limited: Flooding	Somewhat limited: Flooding	Very limited: Flooding	Somewhat limited: Flooding	Somewhat limited: Flooding	Very limited: Flooding
3561:							
Hobbs--------	94	Very limited: Flooding	Not limited	Somewhat limited: Flooding	Not limited	Not limited	Somewhat limited: Flooding
3617:							
Solomon------	85	Very limited: Flooding, Restricted permeability, Too clayey, Ponding	Very limited: Restricted permeability, Too clayey, Ponding	Very limited: Restricted permeability, Too clayey, Ponding, Flooding	Very limited: Too clayey, Ponding	Very limited: Too clayey, Ponding	Very limited: Too clayey, Ponding, Flooding
3633:							
Sutphen------	80	Very limited: Flooding, Ponding, Too clayey, Restricted permeability	Very limited: Ponding, Too clayey, Restricted permeability	Very limited: Ponding, Flooding, Too clayey, Restricted permeability	Very limited: Ponding, Too clayey	Very limited: Ponding, Too clayey	Very limited: Too clayey, Ponding, Flooding
3775:							
Muir---------	94	Very limited: Flooding	Not limited	Not limited	Not limited	Not limited	Not limited
3827:							
Crete--------	95	Somewhat limited: Restricted permeability	Somewhat limited: Restricted permeability	Somewhat limited: Restricted permeability	Not limited	Not limited	Not limited

Table 10.--Recreation--Continued

Map symbol and soil name	Pct. of map unit	Camp areas	Picnic areas	Playgrounds	Paths and trails	Off-road motorcycle trails	Golf fairways
3828:							
Crete--------	94	Somewhat limited Restricted permeability	Somewhat limited Restricted permeability	Somewhat limited Restricted permeability	Not limited	Not limited	Not limited
3830:							
Crete--------	94	Somewhat limited Restricted permeability	Somewhat limited Restricted permeability	Very limited: Slope Restructed permeability	Not limited	Not limited	Not limited
3844:							
Geary--------	89	Not limited	Not limited	Very limited: Slope	Not limited	Not limited	Not limited
3845:							
Geary--------	94	Somewhat limited Slope	Somewhat limited Slope	Very limited: Slope	Not limited	Not limited	Somewhat limited Slope
3880:							
Holder-------	95	Not limited	Not limited	Not limited	Not limited	Not limited	Not limited
3882:							
Holder-------	85	Not limited	Not limited	Somewhat limited Slope	Not limited	Not limited	Not limited
3890:							
Ladysmith----	90	Very limited: Ponding Restricted permeability	Very limited: Ponding Restricted permeability	Very limited: Ponding Restricted permeability	Very limited: Ponding	Very limited: Ponding	Very limited: Ponding
3934:							
Valentine----	85	Somewhat limited Too sandy Slope	Somewhat limited Too sandy Slope	Very limited: Slope Too sandy	Somewhat limited Too sandy	Somewhat limited Too sandy	Somewhat limited Slope
3936:							
Wells--------	50	Not limited	Not limited	Somewhat limited Slope	Not limited	Not limited	Not limited
Ortello------	30	Not limited	Not limited	Somewhat limited Slope	Not limited	Not limited	Not limited
3938:							
Wells--------	50	Not limited	Not limited	Very limited: Slope	Not limited	Not limited	Not limited
Ortello------	30	Not limited	Not limited	Very limited: Slope	Not limited	Not limited	Not limited
4150:							
Kahola-------	85	Very limited: Flooding	Somewhat limited Flooding	Very limited: Flooding	Somewhat limited Flooding	Somewhat limited Flooding	Very limited: Flooding
4151:							
Kahola-------	85	Very limited: Flooding	Not limited	Somewhat limited Flooding	Not limited	Not limited	Somewhat limited Flooding

Table 10.--Recreation--Continued

Map symbol and soil name	Pct. of map unit	Camp areas	Picnic areas	Playgrounds	Paths and trails	Off-road motorcycle trails	Golf fairways
4530:							
Benfield-----	43	Very limited: Slope Restricted permeability	Very limited: Slope Restricted permeability	Very limited: Slope Restricted permeability Depth to bedrock	Very limited: Water erosion Slope	Very limited: Water erosion	Very limited: Slope Depth to bedrock
Florence-----	28	Somewhat limited Gravel content Slope	Somewhat limited Gravel content Slope	Very limited: Slope Gravel content Content of large stones	Not limited	Not limited	Somewhat limited Gravel content Droughty Slope Content of large stones
4550:							
Clime--------	86	Very limited: Slope Restricted permeability Too stony	Very limited: Slope Restricted permeability Too stony	Very limited: Slope Restricted permeability Depth to bedrock Too stony Content of large stones	Very limited: Slope Too stony	Somewhat limited Slope Too stony	Very limited: Slope Depth to bedrock Content of large stones
4590:							
Clime--------	62	Somewhat limited Slope Restricted permeability	Somewhat limited Slope Restricted permeability	Very limited: Slope Depth to bedrock Restricted permeability	Not limited	Not limited	Somewhat limited Slope Depth to bedrock
Sogn---------	20	Very limited: Depth to bedrock	Very limited: Depth to bedrock	Very limited: Depth to bedrock Slope Content of large stones	Not limited	Not limited	Very limited: Depth to bedrock Droughty Content of large stones
4673:							
Irwin--------	85	Somewhat limited Restricted permeability	Somewhat limited Restricted permeability	Somewhat limited Slope Restructed permeability	Not limited	Not limited	Not limited
4735:							
Konza--------	85	Very limited: Ponding Restricted permeability	Very limited: Ponding Restricted permeability	Very limited: Ponding Restricted permeability	Very limited: Ponding	Very limited: Ponding	Very limited: Ponding
4781:							
Tully--------	85	Somewhat limited Restricted permeability	Somewhat limited Restricted permeability	Somewhat limited Restricted permeability	Not limited	Not limited	Not limited
4783:							
Tully--------	85	Somewhat limited Restricted permeability	Somewhat limited Restricted permeability	Very limited: Slope Restructed permeability	Not limited	Not limited	Not limited

Table 10.--Recreation--Continued

Map symbol and soil name	Pct. of map unit	Camp areas	Picnic areas	Playgrounds	Paths and trails	Off-road motorcycle trails	Golf fairways
7031:							
Eudora	85	Very limited: Flooding	Not limited	Somewhat limited: Flooding	Not limited	Not limited	Somewhat limited: Flooding
7081:							
Sarpy	90	Very limited: Flooding Too sandy	Somewhat limited: Too sandy	Somewhat limited: Flooding Too sandy	Somewhat limited: Too sandy	Somewhat limited: Too sandy	Somewhat limited: Flooding Droughty
7082:							
Sarpy	90	Very limited: Flooding Too sandy Gravel content	Somewhat limited: Too sandy Gravel content	Very limited: Gravel content Flooding Too sandy	Somewhat limited: Too sandy	Somewhat limited: Too sandy	Very limited: Droughty Flooding Too sandy Gravel content
7170:							
Reading	85	Very limited: Flooding Restructed permeability	Somewhat limited: Restricted permeability	Somewhat limited: Restricted permeability	Not limited	Not limited	Not limited
7173:							
Reading	85	Very limited: Flooding Restricted permeability	Somewhat limited: Restricted permeability	Somewhat limited: Restricted permeability	Not limited	Not limited	Not limited
7740:							
Haynie	55	Very limited: Flooding	Somewhat limited: Flooding	Very limited: Flooding	Somewhat limited: Flooding	Somewhat limited: Flooding	Very limited: Flooding
9971:							
Arents, earthen dam-	100	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated
9983:							
Gravel pits and quarries	100	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated
9986:							
Miscellaneous water	100	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated
9988:							
Orthents	100	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated
9999:							
Water	100	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated

Table 11.--Wildlife Habitat

(See text for definitions of terms used in this table. Absence of an entry indicates that no rating is applicable.)

Map symbol and soil name	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
2177:												
McCook	Good	Good	Good	Good	Fair	Good	Very poor.	Very poor.	Good	Fair	Very poor.	Good.
2181:												
McCook	Good	Good	Good	Good	Fair	Good	Very poor.	Very poor.	Good	Fair	Very poor.	Good.
Smokyhill	Good	Good	Good	Good	Good	Good	Fair	Fair	Fair	Fair	Good	Fair.
2347:												
McCook	Good	Good	Good	Good	Fair	Good	Very poor.	Very poor.	Good	Fair	Very poor.	Good.
3400:												
Longford	Good	Good	Fair	---	---	Fair	Poor	Fair	Good	---	Poor	Fair.
3545:												
Hobbs	Poor	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
3561:												
Hobbs	Good	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor	Good.
3617:												
Solomon	Fair	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good	---
3633:												
Sutphen	Fair	Fair	Fair	Fair	Fair	Fair	Poor	Good	Fair	Fair	Fair	---
3775:												
Muir	Good	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.	Good.
3827:												
Crete	Good	Good	Good	Fair	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.	Good.
3828:												
Crete	Good	Good	Good	Fair	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.	Good.
3830:												
Crete	Fair	Good	Good	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Good.
3844:												
Geary	Fair	Good	Good	Fair	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.	Good.
3845:												
Geary	Fair	Good	Good	Fair	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.	Good.
3880:												
Holder	Good	Good	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Good	Very poor.	Good.

Table 11.--Wildlife Habitat--Continued

Map symbol and soil name	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
3882:												
Holder	Fair	Good	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Good	Very poor.	Good.
3890:												
Ladysmith	Fair	Good	Good	---	---	Good	Poor	Fair	Good	---	Poor	Good.
3934:												
Valentine	Poor	Fair	Fair	Poor	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.	Fair.
3936:												
Wells	Good	Good	Good	---	---	Fair	Very poor.	Very poor.	Good	---	Very poor.	Fair.
Ortello	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
3938:												
Wells	Good	Good	Good	---	---	Fair	Very poor.	Very poor.	Good	---	Very poor.	Fair.
Ortello	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
4150:												
Kahola	Poor	Fair	Fair	Good	Good	Good	Poor	Fair	Fair	Good	Poor	Good.
4151:												
Kahola	Good	Good	Good	Good	Good	Good	Poor	Fair	Good	Good	Poor	Good.
4530:												
Benfield	Poor	Fair	Fair	---	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
Florence	Poor	Good	Fair	---	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
4550:												
Clime	Poor	Fair	Fair	---	---	Poor	---	Poor	Fair	---	Very poor.	Fair.
4590:												
Clime	Fair	Fair	Good	---	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
Sogn	Very poor.	Very poor.	Poor	---	---	Poor	Very poor.	Very poor.	Very poor.	---	Very poor.	Poor.
4673:												
Irwin	Fair	Good	Good	Good	Good	Fair	Poor	Poor	Fair	Good	Poor	Fair.
4735:												
Konza	Good	Good	Good	---	---	Good	Poor	Poor	Good	---	Fair	Poor.
4781:												
Tully	Good	Good	Good	---	---	Fair	Poor	Poor	Good	---	Poor	Fair.
4783:												
Tully	Fair	Good	Good	---	---	Fair	Poor	Poor	Fair	---	Poor	Fair.

Table 11.--Wildlife Habitat--Continued

Map symbol and soil name	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
7031:												
Eudora	Good	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor	Good.
7081:												
Sarpy	Poor	Poor	Fair	Poor	Poor	---	Very poor.	Very poor.	Poor	Poor	Very poor.	---
7082:												
Sarpy	Poor	Poor	Fair	Poor	Poor	---	Very poor.	Very poor.	Poor	Poor	Very poor.	---
7170:												
Reading	Good	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor	---
7173:												
Reading	Good	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor	---
7740:												
Haynie	Fair	Fair	Fair	Fair	Poor	---	Poor	Poor	Fair	Fair	Poor	---

Table 12.--Building Site Development

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. See text for definitions of terms used in this table.)

Map symbol and soil name	Pct. of map unit	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Shallow excavations	Lawns and landscaping
2177:							
McCook-------	85	Very limited: Flooding	Very limited: Flooding	Very limited: Flooding	Very limited: Flooding Frost action	Somewhat limited Flooding Cutbanks cave	Somewhat limited Flooding
2181:							
McCook-------	68	Very limited: Flooding	Very limited: Flooding	Very limited: Flooding	Very limited: Flooding Frost action	Somewhat limited Flooding Cutbanks cave	Somewhat limited Flooding
Smokyhill----	25	Very limited: Flooding Shrink-swell Ponding	Very limited: Flooding Ponding	Very limited: Flooding Shrink-swell Ponding	Very limited: Flooding Low strength Shrink-swell Ponding	Very limited: Ponding Flooding Cutbanks cave	Very limited: Ponding Flooding
2347:							
McCook-------	85	Very limited: Flooding	Very limited: Flooding	Very limited: Flooding	Somewhat limited Frost action Flooding	Somewhat limited Cutbanks cave	Not limited
3400:							
Longford-----	85	Very limited: Shrink-swell	Very limited: Shrink-swell	Very limited: Shrink-swell	Very limited: Low strength Shrink-swell Frost action	Somewhat limited Cutbanks cave	Not limited
3545:							
Hobbs--------	94	Very limited: Flooding Shrink-swell	Very limited: Flooding Shrink-swell	Very limited: Flooding Shrink-swell	Very limited: Flooding Low strength Frost action Shrink-swell	Somewhat limited Flooding Cutbanks cave	Very limited: Flooding
3561:							
Hobbs--------	94	Very limited: Flooding Shrink-swell	Very limited: Flooding Shrink-swell	Very limited: Flooding Shrink-swell	Very limited: Flooding Low strength Frost action Shrink-swell	Somewhat limited Flooding Cutbanks cave	Somewhat limited Flooding
3617:							
Solomon------	85	Very limited: Flooding Shrink-swell Ponding	Very limited: Flooding Shrink-swell Ponding	Very limited: Flooding Shrink-swell Ponding	Very limited: Shrink-swell Flooding Low strength Ponding Frost action	Very limited: Ponding Flooding Too clayey Cutbanks cave	Very limited: Too clayey Ponding Flooding
3633:							
Sutphen------	80	Very limited: Flooding Shrink-swell Ponding	Very limited: Flooding Shrink-swell Ponding	Very limited: Flooding Shrink-swell Ponding	Very limited: Shrink-swell Flooding Low strength Ponding	Very limited: Ponding Flooding Too clayey Cutbanks cave	Very limited: Too clayey Ponding Flooding

Table 12.--Building Site Development--Continued

Map symbol and soil name	Pct. of map unit	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Shallow excavations	Lawns and landscaping
3775:							
Muir	94	Very limited: Flooding Shrink-swell	Very limited: Flooding	Very limited: Flooding Shrink-swell	Very limited: Low strength Frost action Flooding Shrink-swell	Somewhat limited Cutbanks cave	Not limited
3827:							
Crete	95	Very limited: Shrink-swell	Very limited: Shrink-swell	Very limited: Shrink-swell	Very limited: Shrink-swell Low strength	Somewhat limited Too clayey Cutbanks cave	Not limited
3828:							
Crete	94	Very limited: Shrink-swell	Very limited: Shrink-swell	Very limited: Shrink-swell	Very limited: Shrink-swell Low strength	Somewhat limited Too clayey Cutbanks cave	Not limited
3830:							
Crete	94	Very limited: Shrink-swell	Very limited: Shrink-swell	Very limited: Shrink-swell Slope	Very limited: Low strength Shrink-swell	Somewhat limited Cutbanks cave	Not limited
3844:							
Geary	89	Somewhat limited Shrink-swell	Somewhat limited Shrink-swell	Somewhat limited Shrink-swell Slope	Very limited: Low strength Shrink-swell Frost action	Somewhat limited Cutbanks cave	Not limited
3845:							
Geary	94	Somewhat limited Shrink-swell Slope	Somewhat limited Shrink-swell Slope	Very limited: Slope Shrink-swell	Very limited: Low strength Shrink-swell Frost action Slope	Somewhat limited Slope Cutbanks cave	Somewhat limited Slope
3880:							
Holder	95	Somewhat limited Shrink-swell	Somewhat limited Shrink-swell	Somewhat limited Shrink-swell	Very limited: Low strength Shrink-swell Frost action	Somewhat limited Cutbanks cave	Not limited
3882:							
Holder	85	Somewhat limited Shrink-swell	Somewhat limited Shrink-swell	Somewhat limited Shrink-swell Slope	Very limited: Low strength Shrink-swell Frost action	Somewhat limited Cutbanks cave	Not limited
3890:							
Ladysmith	90	Very limited: Shrink-swell Ponding	Very limited: Shrink-swell Ponding	Very limited: Shrink-swell Ponding	Very limited: Shrink-swell Low strength Ponding Frost action	Very limited: Ponding Too clayey Cutbanks cave	Very limited: Ponding
3934:							
Valentine	85	Somewhat limited Slope	Somewhat limited Slope	Very limited: Slope	Somewhat limited Slope	Very limited: Cutbanks cave Dense layer Slope	Somewhat limited Slope

Table 12.--Building Site Development--Continued

Map symbol and soil name	Pct. of map unit	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Shallow excavations	Lawns and landscaping
3936:							
Wells--------	50	Somewhat limited Shrink-swell	Somewhat limited Shrink-swell	Somewhat limited Shrink-swell	Very limited: Low strength Shrink-swell Frost action	Somewhat limited Cutbanks cave	Not limited
Ortello------	30	Not limited	Not limited	Not limited	Somewhat limited Frost action	Somewhat limited Cutbanks cave	Not limited
3938:							
Wells--------	50	Somewhat limited Shrink-swell	Somewhat limited Shrink-swell	Somewhat limited Shrink-swell Slope	Very limited: Low strength Shrink-swell Frost action	Somewhat limited Cutbanks cave	Not limited
Ortello------	30	Not limited	Not limited	Somewhat limited Slope	Somewhat limited Frost action	Somewhat limited Cutbanks cave	Not limited
4150:							
Kahola-------	85	Very limited: Flooding Shrink-swell	Very limited: Flooding Shrink-swell	Very limited: Flooding Shrink-swell	Very limited: Flooding Low strength Frost action Shrink-swell	Somewhat limited Flooding Cutbanks cave	Very limited: Flooding
4151:							
Kahola-------	85	Very limited: Flooding Shrink-swell	Very limited: Flooding Shrink-swell	Very limited: Flooding Shrink-swell	Very limited: Flooding Low strength Frost action Shrink-swell	Somewhat limited Flooding Cutbanks cave	Somewhat limited Flooding
4530:							
Benfield-----	43	Very limited: Shrink-swell Slope	Very limited: Shrink-swell Slope Depth to soft bedrock	Very limited: Shrink-swell Slope	Very limited: Low strength Shrink-swell Slope	Very limited: Slope Too clayey Cutbanks cave Depth to soft bedrock	Very limited: Slope Depth to bedrock
Florence-----	28	Very limited: Shrink-swell Slope	Very limited: Shrink-swell Slope Depth to hard bedrock	Very limited: Shrink-swell Slope	Very limited: Shrink-swell Low strength Slope	Very limited: Too clayey Slope Cutbanks cave Depth to hard bedrock	Somewhat limited Gravel content Droughty Slope Content of large stones
4550:							
Clime--------	86	Very limited: Slope Shrink-swell	Very limited: Slope Shrink-swell Depth to soft bedrock	Very limited: Slope Shrink-swell	Very limited: Slope Low strength Shrink-swell	Very limited: Slope Too clayey Depth to soft bedrock Cutbanks cave	Very limited: Slope Depth to bedrock Content of large stones
4590:							
Clime--------	62	Very limited: Shrink-swell Slope	Very limited: Shrink-swell Slope Depth to soft bedrock	Very limited: Shrink-swell Slope	Very limited: Low strength Shrink-swell Slope	Somewhat limited Slope Depth to soft bedrock Too clayey Cutbanks cave	Somewhat limited Slope Depth to bedrock

Table 12.--Building Site Development--Continued

Map symbol and soil name	Pct. of map unit	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Shallow excavations	Lawns and landscaping
4590:							
Sogn	20	Very limited: Depth to hard bedrock Shrink-swell	Very limited: Depth to hard bedrock Shrink-swell	Very limited: Depth to hard bedrock Shrink-swell Slope	Very limited: Depth to hard bedrock Low strength Shrink-swell Frost action	Very limited: Depth to hard bedrock Cutbanks cave	Very limited: Depth to bedrock Droughty Content of large stones
4673:							
Irwin	85	Very limited: Shrink-swell	Very limited: Shrink-swell	Very limited: Shrink-swell Slope	Very limited: Shrink-swell Low strength Frost action	Somewhat limited Too clayey Cutbanks cave	Not limited
4735:							
Konza	85	Very limited: Shrink-swell Ponding	Very limited: Shrink-swell Ponding	Very limited: Shrink-swell Ponding	Very limited: Shrink-swell Low strength Ponding Frost action	Very limited: Ponding Too clayey Cutbanks cave	Very limited: Ponding
4781:							
Tully	85	Very limited: Shrink-swell	Very limited: Shrink-swell	Very limited: Shrink-swell	Very limited: Shrink-swell Low strength	Somewhat limited Too clayey Cutbanks cave	Not limited
4783:							
Tully	85	Very limited: Shrink-swell	Very limited: Shrink-swell	Very limited: Shrink-swell Slope	Very limited: Shrink-swell Low strength	Somewhat limited Too clayey Cutbanks cave	Not limited
7031:							
Eudora	85	Very limited: Flooding	Very limited: Flooding	Very limited: Flooding	Very limited: Frost action Flooding	Somewhat limited Flooding Cutbanks cave	Somewhat limited Flooding
7081:							
Sarpy	90	Very limited: Flooding	Very limited: Flooding	Very limited: Flooding	Very limited: Flooding	Very limited: Cutbanks cave Flooding	Somewhat limited Flooding Droughty
7082:							
Sarpy	90	Very limited: Flooding	Very limited: Flooding	Very limited: Flooding	Very limited: Flooding	Very limited: Cutbanks cave Flooding	Very limited: Droughty Flooding Too sandy Gravel content
7170:							
Reading	85	Very limited: Flooding Shrink-swell	Very limited: Flooding Shrink-swell	Very limited: Flooding Shrink-swell	Very limited: Low strength Shrink-swell Frost action Flooding	Somewhat limited Cutbanks cave	Not limited
7173:							
Reading	85	Very limited: Flooding Shrink-swell	Very limited: Flooding Shrink-swell	Very limited: Flooding Shrink-swell	Very limited: Low strength Shrink-swell Frost action Flooding	Somewhat limited Cutbanks cave	Not limited

Table 12.--Building Site Development--Continued

Map symbol and soil name	Pct. of map unit	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Shallow excavations	Lawns and landscaping
7740: Haynie	55	Very limited: Flooding	Very limited: Flooding	Very limited: Flooding	Very limited: Frost action Flooding Low strength	Somewhat limited Flooding Cutbanks cave	Very limited: Flooding
9971: Arents, earthen dam	100	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated
9983: Gravel pits and quarries	100	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated
9986: Miscellaneous water	100	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated
9988: Orthents	100	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated
9999: Water	100	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated

Table 13.--Sanitary Facilities

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. See text for definitions of terms used in this table.)

Map symbol and soil name	Pct. of map unit	Septic tank absorption fields	Sewage lagoons	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
2177:						
McCook	85	Very limited: Flooding Restricted permeability	Very limited: Flooding Seepage	Very limited: Flooding	Very limited: Flooding	Not limited
2181:						
McCook	68	Very limited: Flooding Restricted permeability	Very limited: Flooding Seepage	Very limited: Flooding	Very limited: Flooding	Not limited
Smokyhill	25	Very limited: Flooding Restricted permeability Ponding	Very limited: Flooding Ponding Seepage	Very limited: Flooding Ponding	Very limited: Flooding Ponding	Very limited: Ponding
2347:						
McCook	85	Somewhat limited Restricted permeability Flooding	Somewhat limited Seepage Flooding	Somewhat limited Flooding	Somewhat limited Flooding	Not limited
3400:						
Longford	85	Very limited: Restricted permeability	Not limited	Somewhat limited Too clayey	Not limited	Somewhat limited Too clayey
3545:						
Hobbs	94	Very limited: Flooding Restricted permeability	Very limited: Flooding Seepage	Very limited: Flooding	Very limited: Flooding	Not limited
3561:						
Hobbs	94	Very limited: Flooding Restricted permeability	Very limited: Flooding Seepage	Very limited: Flooding	Very limited: Flooding	Not limited
3617:						
Solomon	85	Very limited: Flooding Restricted permeability Ponding	Very limited: Flooding Ponding	Very limited: Flooding Too clayey Ponding	Very limited: Flooding Ponding	Very limited: Too clayey Hard to compact Ponding
3633:						
Sutphen	80	Very limited: Flooding Restricted permeability Ponding	Very limited: Flooding Ponding	Very limited: Flooding Too clayey Ponding	Very limited: Flooding Ponding	Very limited: Too clayey Hard to compact Ponding

Table 13.--Sanitary Facilities--Continued

Map symbol and soil name	Pct. of map unit	Septic tank absorption fields	Sewage lagoons	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
3775:						
Muir	94	Somewhat limited Restricted permeability Flooding	Somewhat limited Seepage Flooding	Somewhat limited Flooding	Somewhat limited Flooding	Not limited
3827:						
Crete	95	Very limited: Restricted permeability	Not limited	Somewhat limited Too clayey	Not limited	Somewhat limited Too clayey
3828:						
Crete	94	Very limited: Restricted permeability	Not limited	Somewhat limited Too clayey	Not limited	Very limited: Hard to compact Too clayey
3830:						
Crete	94	Very limited: Restricted permeability	Somewhat limited Slope	Somewhat limited Too clayey	Not limited	Somewhat limited Too clayey
3844:						
Geary	89	Somewhat limited Restricted permeability	Somewhat limited Slope Seepage	Somewhat limited Too clayey	Not limited	Somewhat limited Too clayey
3845:						
Geary	94	Somewhat limited Restricted permeability Slope	Very limited: Slope Seepage	Somewhat limited Too clayey Slope	Somewhat limited Slope	Somewhat limited Too clayey Slope
3880:						
Holder	95	Somewhat limited Restricted permeability	Somewhat limited Seepage	Somewhat limited Too clayey	Not limited	Somewhat limited Too clayey
3882:						
Holder	85	Somewhat limited Restricted permeability	Somewhat limited Slope Seepage	Somewhat limited Too clayey	Not limited	Somewhat limited Too clayey
3890:						
Ladysmith	90	Very limited: Restricted permeability Ponding	Very limited: Ponding	Very limited: Too clayey Ponding	Very limited: Ponding	Very limited: Too clayey Hard to compact Ponding
3934:						
Valentine	85	Very limited: Filtering capacity Slope	Very limited: Seepage Slope	Very limited: Seepage Too sandy Slope	Very limited: Seepage Slope	Very limited: Seepage Too sandy Slope
3936:						
Wells	50	Somewhat limited Restricted permeability	Somewhat limited Seepage Slope	Somewhat limited Too clayey	Not limited	Somewhat limited Too clayey

Table 13.--Sanitary Facilities--Continued

Map symbol and soil name	Pct. of map unit	Septic tank absorption fields	Sewage lagoons	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
3936:						
Ortello------	30	Not limited	Very limited: Seepage Slope	Very limited: Seepage	Very limited: Seepage	Somewhat limited Seepage
3938:						
Wells--------	50	Somewhat limited Restricted permeability	Somewhat limited Slope Seepage	Somewhat limited Too clayey	Not limited	Somewhat limited Too clayey
Ortello------	30	Not limited	Very limited: Seepage Slope	Very limited: Seepage	Very limited: Seepage	Somewhat limited Seepage
4150:						
Kahola-------	85	Very limited: Flooding Restricted permeability	Very limited: Flooding Seepage	Very limited: Flooding	Very limited: Flooding	Not limited
4151:						
Kahola-------	85	Very limited: Flooding Restricted permeability	Very limited: Flooding Seepage	Very limited: Flooding	Very limited: Flooding	Not limited
4530:						
Benfield-----	43	Very limited: Restricted permeability Depth to bedrock Slope	Very limited: Depth to soft bedrock Slope	Very limited: Depth to bedrock Too clayey Slope	Very limited: Depth to bedrock Slope	Very limited: Depth to bedrock Too clayey Hard to compact Slope
Florence-----	28	Very limited: Restricted permeability Depth to bedrock Slope	Very limited: Slope Depth to hard bedrock	Very limited: Depth to bedrock Too clayey Content of large stones Slope	Somewhat limited Slope Depth to bedrock	Very limited: Too clayey Gravel content Content of large stones Slope Depth to bedrock
4550:						
Clime--------	86	Very limited: Restricted permeability Depth to bedrock Slope	Very limited: Depth to soft bedrock Slope	Very limited: Slope Depth to bedrock Too clayey	Very limited: Slope Depth to bedrock	Very limited: Depth to bedrock Slope Too clayey
4590:						
Clime--------	62	Very limited: Restricted permeability Depth to bedrock Slope	Very limited: Depth to soft bedrock Slope	Very limited: Depth to bedrock Too clayey Slope	Very limited: Depth to bedrock Slope	Very limited: Depth to bedrock Too clayey Hard to compact Slope

Table 13.--Sanitary Facilities--Continued

Map symbol and soil name	Pct. of map unit	Septic tank absorption fields	Sewage lagoons	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
4590:						
Sogn	20	Very limited: Depth to bedrock	Very limited: Depth to hard bedrock Slope	Very limited: Depth to bedrock Too clayey	Very limited: Depth to bedrock	Very limited: Depth to bedrock Too clayey
4673:						
Irwin	85	Very limited: Restricted permeability	Somewhat limited Slope	Very limited: Too clayey	Not limited	Very limited: Too clayey Hard to compact
4735:						
Konza	85	Very limited: Restricted permeability Ponding	Very limited: Ponding	Very limited: Ponding Too clayey	Very limited: Ponding	Very limited: Too clayey Hard to compact Ponding
4781:						
Tully	85	Very limited: Restricted permeability	Not limited	Very limited: Too clayey	Not limited	Very limited: Too clayey Hard to compact
4783:						
Tully	85	Very limited: Restricted permeability	Somewhat limited Slope	Very limited: Too clayey	Not limited	Very limited: Too clayey Hard to compact
7031:						
Eudora	85	Very limited: Flooding	Very limited: Flooding Seepage	Very limited: Flooding Seepage	Very limited: Flooding Seepage	Somewhat limited Seepage
7081:						
Sarpy	90	Very limited: Flooding Filtering capacity	Very limited: Flooding Seepage	Very limited: Flooding Seepage Too sandy	Very limited: Flooding Seepage	Very limited: Too sandy Seepage
7082:						
Sarpy	90	Very limited: Flooding Filtering capacity	Very limited: Flooding Seepage	Very limited: Flooding Seepage Too sandy	Very limited: Flooding Seepage	Very limited: Too sandy Seepage
7170:						
Reading	85	Very limited: Restricted permeability Flooding	Somewhat limited Flooding	Somewhat limited Too clayey Flooding	Somewhat limited Flooding	Somewhat limited Too clayey
7173:						
Reading	85	Very limited: Restricted permeability Flooding	Somewhat limited Flooding	Somewhat limited Too clayey Flooding	Somewhat limited Flooding	Somewhat limited Too clayey

Table 13.--Sanitary Facilities--Continued

Map symbol and soil name	Pct. of map unit	Septic tank absorption fields	Sewage lagoons	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
7740: Haynie	55	Very limited: Flooding Restricted permeability	Very limited: Flooding Seepage	Very limited: Flooding	Very limited: Flooding	Not limited
9971: Arents, earthen dam	100	Not rated	Not rated	Not rated	Not rated	Not rated
9983: Gravel pits and quarries	100	Not rated	Not rated	Not rated	Not rated	Not rated
9986: Miscellaneous water	100	Not rated	Not rated	Not rated	Not rated	Not rated
9988: Orthents	100	Not rated	Not rated	Not rated	Not rated	Not rated
9999: Water	100	Not rated	Not rated	Not rated	Not rated	Not rated

Table 14.--Agricultural Waste Management

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. See text for definitions of terms used in this table.)

Map symbol and soil name	Pct. of map unit	Application of manure and food-processing waste	Application of sewage sludge	Disposal of wastewater by irrigation	Overland flow of wastewater	Rapid infiltration of wastewater	Slow rate treatment of wastewater
2177:							
McCook	85	Somewhat limited Flooding	Very limited: Flooding	Somewhat limited Flooding	Very limited: Flooding Seepage	Very limited: Restricted permeability Flooding	Somewhat limited Flooding
2181:							
McCook	68	Somewhat limited Flooding	Very limited: Flooding	Somewhat limited Flooding	Very limited: Flooding Seepage	Very limited: Restricted permeability Flooding	Somewhat limited Flooding
Smokyhill	25	Very limited: Restricted permeability Ponding Flooding	Very limited: Flooding Restricted permeability Ponding	Very limited: Restricted permeability Ponding Flooding	Very limited: Flooding Seepage Ponding Too level	Very limited: Restricted permeability Ponding Flooding	Very limited: Ponding Restricted permeability Flooding
2347:							
McCook	85	Not limited	Somewhat limited Flooding	Not limited	Very limited: Seepage Flooding	Very limited: Restricted permeability	Not limited
3400:							
Longford	85	Very limited: Restricted permeability	Very limited: Restricted permeability	Very limited: Restricted permeability	Very limited: Seepage	Very limited: Restricted permeability	Somewhat limited Restricted permeability
3545:							
Hobbs	94	Very limited: Flooding	Very limited: Flooding	Very limited: Flooding	Very limited: Flooding Seepage	Very limited: Flooding Restricted permeability	Very limited: Flooding
3561:							
Hobbs	94	Somewhat limited Flooding	Very limited: Flooding	Somewhat limited Flooding	Very limited: Flooding Seepage	Very limited: Restricted permeability Flooding	Somewhat limited Flooding
3617:							
Solomon	85	Very limited: Restricted permeability Ponding Flooding Runoff	Very limited: Restricted permeability Flooding Ponding	Very limited: Restricted permeability Ponding Flooding	Very limited: Flooding Ponding Too level	Very limited: Restricted permeability Ponding Flooding	Very limited: Restricted permeability Ponding Flooding
3633:							
Sutphen	80	Very limited: Restricted permeability Ponding Flooding Runoff	Very limited: Restricted permeability Flooding Ponding	Very limited: Restricted permeability Ponding Flooding	Very limited: Flooding Ponding Too level	Very limited: Restricted permeability Ponding Flooding	Very limited: Restricted permeability Ponding Flooding

Table 14.--Agricultural Waste Management--Continued

Map symbol and soil name	Pct. of map unit	Application of manure and food-processing waste	Application of sewage sludge	Disposal of wastewater by irrigation	Overland flow of wastewater	Rapid infiltration of wastewater	Slow rate treatment of wastewater
3775:							
Muir	94	Not limited	Somewhat limited Flooding	Not limited	Very limited: Seepage Flooding	Very limited: Restricted permeability	Not limited
3827:							
Crete	95	Very limited: Restricted permeability Too acid	Very limited: Restricted permeability Too acid	Very limited: Restricted permeability Too acid	Somewhat limited Seepage Too level Too acid	Very limited: Restricted permeability	Somewhat limited Restricted permeability Too acid
3828:							
Crete	94	Very limited: Restricted permeability Too acid	Very limited: Restricted permeability Too acid	Very limited: Restricted permeability Too acid	Somewhat limited Seepage Too acid	Very limited: Restricted permeability	Somewhat limited Restricted permeability Too acid
3830:							
Crete	94	Very limited: Restricted permeability Too acid	Very limited: Restricted permeability Too acid	Very limited: Restricted permeability Too steep for surface application Too acid	Somewhat limited Seepage Too acid	Very limited: Restricted permeability Slope	Somewhat limited Restricted permeability Too steep for surface application Too acid
3844:							
Geary	89	Somewhat limited Too acid	Somewhat limited Too acid	Somewhat limited Too steep for surface application Too acid	Very limited: Seepage Too acid	Very limited: Restricted permeability Slope	Somewhat limited Too steep for surface application Too acid
3845:							
Geary	94	Somewhat limited Slope Too acid	Somewhat limited Slope Too acid	Very limited: Too steep for surface application Too steep for sprinkler application Too acid	Very limited: Seepage Too steep for surface application Too acid	Very limited: Restricted permeability Slope	Very limited: Too steep for surface application Too steep for sprinkler application Too acid
3880:							
Holder	95	Somewhat limited Too acid	Somewhat limited Too acid	Somewhat limited Too acid	Very limited: Seepage Too acid	Very limited: Restricted permeability	Somewhat limited Too acid
3882:							
Holder	85	Somewhat limited Too acid	Somewhat limited Too acid	Somewhat limited Too acid Too steep for surface application	Very limited: Seepage Too acid	Very limited: Restricted permeability Slope	Somewhat limited Too acid Too steep for surface application
3890:							
Ladysmith	90	Very limited: Restricted permeability Ponding Runoff	Very limited: Restricted permeability Ponding	Very limited: Restricted permeability Ponding	Very limited: Ponding Seepage	Very limited: Restricted permeability Ponding	Very limited: Restricted permeability Ponding

Table 14.--Agricultural Waste Management--Continued

Map symbol and soil name	Pct. of map unit	Application of manure and food-processing waste	Application of sewage sludge	Disposal of wastewater by irrigation	Overland flow of wastewater	Rapid infiltration of wastewater	Slow rate treatment of wastewater
3934:							
Valentine----	85	Very limited: Filtering capacity Leaching Slope Droughty	Very limited: Filtering capacity Slope Droughty	Very limited: Too steep for surface application Filtering capacity Too steep for sprinkler application Droughty	Very limited: Seepage Too steep for surface application	Very limited: Slope	Very limited: Too steep for surface application Filtering capacity Too steep for sprinkler application
3936:							
Wells--------	50	Somewhat limited Too acid	Somewhat limited Too acid	Somewhat limited Too acid	Very limited: Seepage Too acid	Very limited: Restricted permeability	Somewhat limited Too acid
Ortello------	30	Somewhat limited Filtering capacity	Somewhat limited Filtering capacity	Somewhat limited Filtering capacity	Very limited: Seepage	Somewhat limited Restricted permeability	Somewhat limited Filtering capacity
3938:							
Wells--------	50	Somewhat limited Too acid	Somewhat limited Too acid	Somewhat limited Too steep for surface application Too acid	Very limited: Seepage Too acid	Very limited: Restricted permeability Slope	Somewhat limited Too steep for surface application Too acid
Ortello------	30	Somewhat limited Filtering capacity	Somewhat limited Filtering capacity	Somewhat limited Too steep for surface application Filtering capacity	Very limited: Seepage	Somewhat limited Slope Restricted permeability	Somewhat limited Too steep for surface application Filtering capacity
4150:							
Kahola-------	85	Very limited: Flooding	Very limited: Flooding	Very limited: Flooding	Very limited: Flooding Seepage	Very limited: Flooding Restricted permeability	Very limited: Flooding
4151:							
Kahola-------	85	Somewhat limited Flooding	Very limited: Flooding	Somewhat limited Flooding	Very limited: Flooding Seepage	Very limited: Restricted permeability Flooding	Somewhat limited Flooding
4530:							
Benfield-----	43	Very limited: Restricted permeability Slope Droughty Depth to bedrock	Very limited: Low adsorption Restricted permeability Slope Droughty Depth to bedrock	Very limited: Restricted permeability Too steep for surface application Too steep for sprinkler application Droughty Depth to bedrock	Very limited: Depth to bedrock Too steep for surface application Seepage	Very limited: Restricted permeability Depth to bedrock Slope	Very limited: Depth to bedrock Too steep for surface application Too steep for sprinkler application Restricted permeability

Table 14.--Agricultural Waste Management--Continued

Map symbol and soil name	Pct. of map unit	Application of manure and food-processing waste	Application of sewage sludge	Disposal of wastewater by irrigation	Overland flow of wastewater	Rapid infiltration of wastewater	Slow rate treatment of wastewater
4530:							
Florence-----	28	Somewhat limited Droughty Restricted permeability Slope	Very limited: Low adsorption Droughty Restricted permeability Slope	Very limited: Too steep for surface application Too steep for sprinkler application Droughty Restricted permeability	Very limited: Seepage Too steep for surface application Cobble content Depth to bedrock	Very limited: Restricted permeability Depth to bedrock Slope Cobble content	Very limited: Too steep for surface application Too steep for sprinkler application Restricted permeability Depth to bedrock
4550:							
Clime--------	86	Very limited: Slope Restricted permeability Depth to bedrock Too stony Droughty	Very limited: Low adsorption Slope Restricted permeability Depth to bedrock Droughty	Very limited: Too steep for surface application Too steep for sprinkler application Restricted permeability Depth to bedrock Droughty	Very limited: Depth to bedrock Too steep for surface application Seepage	Very limited: Slope Restricted permeability Depth to bedrock	Very limited: Depth to bedrock Too steep for surface application Too steep for sprinkler application Restricted permeability
4590:							
Clime--------	62	Very limited: Restricted permeability Slope Depth to bedrock Droughty	Very limited: Low adsorption Restricted permeability Slope Depth to bedrock Droughty	Very limited: Restricted permeability Too steep for surface application Too steep for sprinkler application Depth to bedrock Droughty	Very limited: Depth to bedrock Too steep for surface application Seepage	Very limited: Restricted permeability Depth to bedrock Slope	Very limited: Depth to bedrock Too steep for surface application Too steep for sprinkler application Restricted permeability
Sogn---------	20	Very limited: Depth to bedrock Droughty Runoff	Very limited: Droughty Depth to bedrock Low adsorption	Very limited: Droughty Depth to bedrock Too steep for surface application	Very limited: Seepage Depth to bedrock	Very limited: Depth to bedrock Restricted permeability Slope	Very limited: Depth to bedrock Too steep for surface application
4673:							
Irwin--------	85	Very limited: Restricted permeability Runoff Sodium content	Very limited: Restricted permeability Sodium content	Very limited: Restricted permeability Too steep for surface application Sodium content	Somewhat limited Seepage Sodium content	Very limited: Restricted permeability Slope	Very limited: Restricted permeability Too steep for surface application Sodium content

Table 14.--Agricultural Waste Management--Continued

Map symbol and soil name	Pct. of map unit	Application of manure and food-processing waste	Application of sewage sludge	Disposal of wastewater by irrigation	Overland flow of wastewater	Rapid infiltration of wastewater	Slow rate treatment of wastewater
4735:							
Konza	85	Very limited: Restricted permeability Ponding Runoff Too acid	Very limited: Restricted permeability Ponding Too acid	Very limited: Restricted permeability Ponding Too acid	Very limited: Ponding Seepage Too acid	Very limited: Restricted permeability Ponding	Very limited: Restricted permeability Ponding Too acid
4781:							
Tully	85	Very limited: Restricted permeability	Very limited: Restricted permeability	Very limited: Restricted permeability	Somewhat limited Seepage	Very limited: Restricted permeability	Somewhat limited Restricted permeability
4783:							
Tully	85	Very limited: Restricted permeability	Very limited: Restricted permeability	Very limited: Restricted permeability Too steep for surface application	Somewhat limited Seepage	Very limited: Restricted permeability Slope	Somewhat limited Restricted permeability Too steep for surface application
7031:							
Eudora	85	Somewhat limited Flooding Filtering capacity	Very limited: Flooding Filtering capacity	Somewhat limited Flooding Filtering capacity	Very limited: Flooding Seepage	Very limited: Restricted permeability Flooding	Somewhat limited Flooding Filtering capacity
7081:							
Sarpy	90	Very limited: Filtering capacity Flooding Leaching Droughty	Very limited: Flooding Filtering capacity Droughty	Very limited: Filtering capacity Flooding Droughty	Very limited: Flooding Seepage	Somewhat limited Flooding	Very limited: Filtering capacity Flooding
7082:							
Sarpy	90	Very limited: Droughty Filtering capacity Flooding Leaching	Very limited: Droughty Flooding Filtering capacity	Very limited: Droughty Filtering capacity Flooding	Very limited: Flooding Seepage	Somewhat limited Flooding	Very limited: Filtering capacity Flooding
7170:							
Reading	85	Somewhat limited Restricted permeability Too acid	Somewhat limited Flooding Restricted permeability Too acid	Somewhat limited Restricted permeability Too acid	Very limited: Seepage Flooding Too acid	Very limited: Restricted permeability	Somewhat limited Restricted permeability Too acid
7173:							
Reading	85	Somewhat limited Restricted permeability Too acid	Somewhat limited Flooding Restricted permeability Too acid	Somewhat limited Restricted permeability Too acid	Somewhat limited Seepage Flooding Too acid	Very limited: Restricted permeability	Somewhat limited Restricted permeability Too acid
7740:							
Haynie	55	Very limited: Flooding	Very limited: Flooding	Very limited: Flooding	Very limited: Flooding Seepage	Very limited: Flooding Restricted permeability	Very limited: Flooding

Table 14.--Agricultural Waste Management--Continued

Map symbol and soil name	Pct. of map unit	Application of manure and food-processing waste	Application of sewage sludge	Disposal of wastewater by irrigation	Overland flow of wastewater	Rapid infiltration of wastewater	Slow rate treatment of wastewater
9971: Arents, earthen dam-	100	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated
9983: Gravel pits and quarries	100	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated
9986: Miscellaneous water-------	100	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated
9988: Orthents-----	100	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated
9999: Water--------	100	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated

Table 15a.--Construction Materials

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. See text for definitions of terms used in this table.)

Map symbol and soil name	Pct. of map unit	Potential source of gravel	Potential source of sand
2177:			
McCook	85	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
2181:			
McCook	68	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
Smokyhill	25	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
2347:			
McCook	85	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
3400:			
Longford	85	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
3545:			
Hobbs	94	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
3561:			
Hobbs	94	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
3617:			
Solomon	85	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
3633:			
Sutphen	80	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
3775:			
Muir	94	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
3827:			
Crete	95	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
3828:			
Crete	94	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer

Table 15a.--Construction Materials--Continued

Map symbol and soil name	Pct. of map unit	Potential source of gravel	Potential source of sand
3830:			
Crete	94	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
3844:			
Geary	89	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
3845:			
Geary	94	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
3880:			
Holder	95	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
3882:			
Holder	85	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
3890:			
Ladysmith	90	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
3934:			
Valentine	85	Poor: Bottom layer Thickest layer	Fair: Thickest layer Bottom layer
3936:			
Wells	50	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
Ortello	30	Poor: Bottom layer Thickest layer	Fair: Bottom layer Thickest layer
3938:			
Wells	50	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
Ortello	30	Poor: Bottom layer Thickest layer	Fair: Bottom layer Thickest layer
4150:			
Kahola	85	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
4151:			
Kahola	85	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer

Table 15a.--Construction Materials--Continued

Map symbol and soil name	Pct. of map unit	Potential source of gravel	Potential source of sand
4530:			
Benfield	43	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
Florence	28	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
4550:			
Clime	86	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
4590:			
Clime	62	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
Sogn	20	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
4673:			
Irwin	85	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
4735:			
Konza	85	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
4781:			
Tully	85	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
4783:			
Tully	85	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
7031:			
Eudora	85	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
7081:			
Sarpy	90	Poor: Bottom layer Thickest layer	Fair: Thickest layer Bottom layer
7082:			
Sarpy	90	Poor: Bottom layer Thickest layer	Fair: Bottom layer Thickest layer
7170:			
Reading	85	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer

Table 15a.--Construction Materials--Continued

Map symbol and soil name	Pct. of map unit	Potential source of gravel	Potential source of sand
7173:			
Reading	85	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
7740:			
Haynie	55	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
9971:			
Arents, earthen dam	100	Not rated	Not rated
9983:			
Gravel pits and quarries	100	Not rated	Not rated
9986:			
Miscellaneous water-	100	Not rated	Not rated
9988:			
Orthents	100	Not rated	Not rated
9999:			
Water	100	Not rated	Not rated

Table 15b.--Construction Materials

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. See text for definitions of terms used in this table.)

Map symbol and soil name	Pct. of map unit	Potential source of reclamation material	Potential source of roadfill	Potential source of topsoil
2177:				
McCook	85	Fair: Low content of organic matter	Poor: Low strength	Good
2181:				
McCook	68	Fair: Low content of organic matter	Poor: Low strength	Good
Smokyhill	25	Fair: Too clayey Low content of organic matter Water erosion	Poor: Low strength Shrink-swell	Fair: Too clayey
2347:				
McCook	85	Fair: Low content of organic matter	Poor: Low strength	Good
3400:				
Longford	85	Fair: Too clayey Too acid	Poor: Low strength Shrink-swell	Fair: Too clayey
3545:				
Hobbs	94	Fair: Low content of organic matter	Poor: Low strength Shrink-swell	Good
3561:				
Hobbs	94	Fair: Low content of organic matter	Poor: Low strength Shrink-swell	Good
3617:				
Solomon	85	Poor: Too clayey	Poor: Low strength Shrink-swell	Poor: Too clayey
3633:				
Sutphen	80	Poor: Too clayey Low content of organic matter	Poor: Low strength Shrink-swell	Poor: Too clayey
3775:				
Muir	94	Good	Poor: Low strength	Good
3827:				
Crete	95	Poor: Too clayey Low content of organic matter Too acid Water erosion	Poor: Low strength Shrink-swell	Poor: Too clayey

Table 15b.--Construction Materials--Continued

Map symbol and soil name	Pct. of map unit	Potential source of reclamation material	Potential source of roadfill	Potential source of topsoil
3828:				
Crete	94	Poor: Too clayey Low content of organic matter Too acid Water erosion	Poor: Low strength Shrink-swell	Poor: Too clayey
3830:				
Crete	94	Fair: Too clayey Low content of organic matter Too acid Water erosion	Poor: Low strength Shrink-swell	Fair: Too clayey
3844:				
Geary	89	Fair: Too clayey Too acid	Poor: Low strength Shrink-swell	Fair: Too clayey
3845:				
Geary	94	Fair: Too clayey Too acid	Poor: Low strength Shrink-swell	Fair: Slope Too clayey
3880:				
Holder	95	Fair: Too acid Too clayey	Poor: Low strength Shrink-swell	Fair: Too clayey
3882:				
Holder	85	Fair: Too acid Too clayey	Poor: Low strength Shrink-swell	Fair: Too clayey
3890:				
Ladysmith	90	Poor: Too clayey Low content of organic matter Water erosion	Poor: Low strength Shrink-swell	Poor: Too clayey
3934:				
Valentine	85	Poor: Too sandy Wind erosion Low content of organic matter Droughty	Poor: Low strength	Poor: Hard to reclaim Too sandy Slope
3936:				
Wells	50	Fair: Low content of organic matter Too acid Too clayey	Poor: Low strength Shrink-swell	Fair: Too clayey
Ortello	30	Fair: Low content of organic matter	Poor: Low strength	Good

Table 15b.--Construction Materials--Continued

Map symbol and soil name	Pct. of map unit	Potential source of reclamation material	Potential source of roadfill	Potential source of topsoil
3938:				
Wells	50	Fair: Low content of organic matter Too acid Too clayey	Poor: Low strength Shrink-swell	Fair: Too clayey
Ortello	30	Fair: Low content of organic matter	Poor: Low strength	Good
4150:				
Kahola	85	Good	Poor: Low strength Shrink-swell	Good
4151:				
Kahola	85	Good	Poor: Low strength Shrink-swell	Good
4530:				
Benfield	43	Poor: Too clayey Droughty Depth to bedrock Water erosion	Poor: Depth to bedrock Low strength Shrink-swell Slope	Poor: Too clayey Slope Rock fragments Depth to bedrock
Florence	28	Poor: Too clayey Droughty Cobble content	Poor: Low strength Shrink-swell Cobble content Depth to bedrock	Poor: Too clayey Hard to reclaim Rock fragments Slope
4550:				
Clime	86	Poor: Too clayey Depth to bedrock Low content of organic matter Droughty Carbonate content	Poor: Depth to bedrock Low strength Slope Shrink-swell	Poor: Slope Too clayey Depth to bedrock Carbonate content
4590:				
Clime	62	Poor: Too clayey Depth to bedrock Low content of organic matter Droughty Carbonate content	Poor: Depth to bedrock Low strength Shrink-swell	Poor: Too clayey Slope Depth to bedrock Carbonate content
Sogn	20	Poor: Droughty Depth to bedrock Too clayey	Poor: Depth to bedrock Low strength	Poor: Depth to bedrock Too clayey

Table 15b.--Construction Materials--Continued

Map symbol and soil name	Pct. of map unit	Potential source of reclamation material	Potential source of roadfill	Potential source of topsoil
4673:				
Irwin	85	Poor: Too clayey Low content of organic matter Sodium content Water erosion	Poor: Low strength Shrink-swell	Poor: Too clayey Sodium content
4735:				
Konza	85	Poor: Too clayey Too acid Water erosion	Poor: Low strength Shrink-swell	Poor: Too clayey
4781:				
Tully	85	Fair: Too clayey Water erosion	Poor: Low strength Shrink-swell	Fair: Too clayey
4783:				
Tully	85	Fair: Too clayey Water erosion	Poor: Low strength Shrink-swell	Fair: Too clayey
7031:				
Eudora	85	Fair: Low content of organic matter	Poor: Low strength	Good
7081:				
Sarpy	90	Poor: Too sandy Wind erosion Droughty Low content of organic matter	Poor: Low strength	Poor: Too sandy
7082:				
Sarpy	90	Poor: Too sandy Wind erosion Droughty Low content of organic matter	Poor: Low strength	Poor: Too sandy
7170:				
Reading	85	Fair: Too clayey Too acid	Poor: Low strength Shrink-swell	Fair: Too clayey
7173:				
Reading	85	Fair: Too clayey Too acid	Poor: Low strength Shrink-swell	Fair: Too clayey
7740:				
Haynie	55	Fair: Low content of organic matter Water erosion Carbonate content	Poor: Low strength	Fair: Carbonate content

Table 15b.--Construction Materials--Continued

Map symbol and soil name	Pct. of map unit	Potential source of reclamation material	Potential source of roadfill	Potential source of topsoil
9971: Arents, earthen dam	100	Not rated	Not rated	Not rated
9983: Gravel pits and quarries	100	Not rated	Not rated	Not rated
9986: Miscellaneous water-	100	Not rated	Not rated	Not rated
9988: Orthents	100	Not rated	Not rated	Not rated
9999: Water	100	Not rated	Not rated	Not rated

Table 16.--Water Management

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. See text for definitions of terms used in this table.)

Map symbol and soil name	Pct. of map unit	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds
2177:				
McCook	85	Somewhat limited Seepage	Very limited: Piping	Very limited: Depth to water
2181:				
McCook	68	Somewhat limited Seepage	Very limited: Piping	Very limited: Depth to water
Smokyhill	25	Somewhat limited Seepage	Very limited: Ponding Piping	Very limited: Depth to water
2347:				
McCook	85	Somewhat limited Seepage	Very limited: Piping	Very limited: Depth to water
3400:				
Longford	85	Somewhat limited Seepage	Not limited	Very limited: Depth to water
3545:				
Hobbs	94	Somewhat limited Seepage	Somewhat limited Piping	Very limited: Depth to water
3561:				
Hobbs	94	Somewhat limited Seepage	Somewhat limited Piping	Very limited: Depth to water
3617:				
Solomon	85	Not limited	Very limited: Ponding Hard to pack	Very limited: Depth to water
3633:				
Sutphen	80	Not limited	Very limited: Ponding Hard to pack	Very limited: Depth to water
3775:				
Muir	94	Somewhat limited Seepage	Somewhat limited Piping	Very limited: Depth to water
3827:				
Crete	95	Somewhat limited Seepage	Somewhat limited Hard to pack	Very limited: Depth to water
3828:				
Crete	94	Somewhat limited Seepage	Somewhat limited Hard to pack	Very limited: Depth to water
3830:				
Crete	94	Somewhat limited Seepage	Not limited	Very limited: Depth to water
3844:				
Geary	89	Somewhat limited Seepage	Not limited	Very limited: Depth to water

Table 16.--Water Management--Continued

Map symbol and soil name	Pct. of map unit	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds
3845:				
Geary	94	Somewhat limited Seepage Slope	Not limited	Very limited: Depth to water
3880:				
Holder	95	Somewhat limited Seepage	Not limited	Very limited: Depth to water
3882:				
Holder	85	Somewhat limited Seepage	Not limited	Very limited: Depth to water
3890:				
Ladysmith	90	Not limited	Very limited: Ponding Hard to pack	Very limited: Depth to water
3934:				
Valentine	85	Very limited: Seepage	Somewhat limited Seepage	Very limited: Depth to water
3936:				
Wells	50	Somewhat limited Seepage	Somewhat limited Piping	Very limited: Depth to water
Ortello	30	Very limited: Seepage	Somewhat limited Seepage	Very limited: Depth to water
3938:				
Wells	50	Somewhat limited Seepage	Somewhat limited Piping	Very limited: Depth to water
Ortello	30	Very limited: Seepage	Somewhat limited Seepage	Very limited: Depth to water
4150:				
Kahola	85	Somewhat limited Seepage	Somewhat limited Piping	Very limited: Depth to water
4151:				
Kahola	85	Somewhat limited Seepage	Somewhat limited Piping	Very limited: Depth to water
4530:				
Benfield	43	Somewhat limited Slope Depth to bedrock	Somewhat limited Hard to pack Thin layer	Very limited: Depth to water
Florence	28	Somewhat limited Seepage Depth to bedrock	Somewhat limited Seepage Thin layer	Very limited: Depth to water
4550:				
Clime	86	Somewhat limited Slope Depth to bedrock	Somewhat limited Thin layer Hard to pack	Very limited: Depth to water

Table 16.--Water Management--Continued

Map symbol and soil name	Pct. of map unit	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds
4590:				
Clime	62	Somewhat limited Depth to bedrock Slope	Somewhat limited Thin layer Hard to pack	Very limited: Depth to water
Sogn	20	Very limited: Depth to bedrock	Very limited: Thin layer	Very limited: Depth to water
4673:				
Irwin	85	Not limited	Somewhat limited Hard to pack	Very limited: Depth to water
4735:				
Konza	85	Not limited	Very limited: Hard to pack Ponding	Very limited: Depth to water
4781:				
Tully	85	Somewhat limited Seepage	Somewhat limited Hard to pack	Very limited: Depth to water
4783:				
Tully	85	Somewhat limited Seepage	Somewhat limited Hard to pack	Very limited: Depth to water
7031:				
Eudora	85	Very limited: Seepage	Very limited: Piping	Very limited: Depth to water
7081:				
Sarpy	90	Very limited: Seepage	Somewhat limited Seepage	Very limited: Depth to water
7082:				
Sarpy	90	Very limited: Seepage	Somewhat limited Seepage	Very limited: Depth to water
7170:				
Reading	85	Somewhat limited Seepage	Not limited	Very limited: Depth to water
7173:				
Reading	85	Somewhat limited Seepage	Not limited	Very limited: Depth to water
7740:				
Haynie	55	Somewhat limited Seepage	Somewhat limited Piping	Very limited: Depth to water
9971:				
Arents, earthen dam	100	Not rated	Not rated	Not rated
9983:				
Gravel pits and quarries	100	Not rated	Not rated	Not rated

Table 16.--Water Management--Continued

Map symbol and soil name	Pct. of map unit	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds
9986: Miscellaneous water	100	Not rated	Not rated	Not rated
9988: Orthents	100	Not rated	Not rated	Not rated
9999: Water	100	Not rated	Not rated	Not rated

Table 17.--Engineering Index Properties

(Absence of an entry indicates that the data were not estimated.)

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
2177:												
McCook---	0-16	Silt loam---	CL	A-4	0	0	100	100	85-100	60-90	28-37	9-13
	16-25	Silt loam---	CL	A-6	0	0	100	100	85-100	60-90	26-35	10-13
	25-60	Very fine sandy loam.	CL	A-4	0	0	100	97-100	81-100	48-90	21-35	6-12
2181:												
McCook---	0-12	Silt loam---	CL	A-4	0	0	100	100	85-100	60-90	28-37	9-13
	12-23	Silt loam---	CL	A-6	0	0	100	100	85-100	60-90	26-35	10-13
	23-60	Very fine sandy loam.	CL	A-4	0	0	100	97-100	81-100	48-90	21-35	6-12
Smokyhill---	0-6	Silt loam---	CL	A-6	0	0	100	100	90-100	70-90	33-46	12-19
	6-14	Silty clay loam	CL	A-7	0	0	100	100	97-100	85-95	42-54	21-29
	14-30	Silty clay loam	CH	A-7-6	0	0	100	100	95-100	85-95	46-56	25-32
	30-72	Silt loam---	CL, CL-ML	A-4	0	0	100	97-100	81-100	48-90	20-33	6-12
2347:												
McCook---	0-16	Silt loam---	CL	A-4	0	0	100	100	85-100	60-90	28-37	9-13
	16-25	Silt loam---	CL	A-6	0	0	100	100	85-100	60-90	26-35	10-13
	25-60	Very fine sandy loam.	CL	A-4	0	0	100	97-100	81-100	48-90	21-35	6-12
3400:												
Longford---	0-11	Loam---	CL	A-6	0	0	100	95-100	85-95	60-75	28-46	9-19
	11-16	Clay loam---	CL	A-7-6	0	0	100	95-100	85-100	60-80	41-55	20-29
	16-46	Clay loam---	CL	A-7-6	0	0	100	95-100	90-100	70-80	46-55	25-29
	46-54	Clay loam---	CL	A-7-6, A-6	0	0	100	95-100	85-100	60-80	31-47	13-25
	54-60	Loam---	CL	A-6, A-7-6	0	0	100	95-100	90-100	60-80	31-47	13-25
3545:												
Hobbs---	0-8	Silt loam---	CL	A-6, A-4	0	0	100	100	95-100	85-100	30-46	9-19
	8-24	Silt loam---	CL	A-6	0	0	100	100	95-100	85-100	26-39	10-19
	24-44	Silt loam---	CL	A-6	0	0	100	100	95-100	80-100	26-42	10-21
	44-60	Silt loam---	CL	A-6	0	0	100	100	95-100	80-100	26-42	10-21
3561:												
Hobbs---	0-8	Silt loam---	CL	A-6, A-4	0	0	100	100	95-100	85-100	30-46	9-19
	8-24	Silt loam---	CL	A-6	0	0	100	100	95-100	85-100	26-39	10-19
	24-44	Silt loam---	CL	A-6	0	0	100	100	95-100	80-100	26-42	10-21
	44-60	Silt loam---	CL	A-6	0	0	100	100	95-100	80-100	26-42	10-21
3617:												
Solomon---	0-8	Silty clay---	CH	A-7	0	0	100	100	95-100	90-95	55-73	29-40
	8-19	Silty clay---	CH	A-7	0	0	100	100	95-100	90-95	55-73	29-40
	19-36	Clay---	CH	A-7	0	0	100	100	90-100	75-95	53-70	29-40
	36-50	Clay---	CH	A-7	0	0	100	100	90-100	75-95	53-70	29-40
	50-60	Clay---	CH	A-7	0	0	100	100	90-100	75-95	53-70	29-40
3633:												
Sutphen---	0-6	Silty clay---	CH	A-7	0	0	100	100	95-100	85-95	50-73	25-40
	6-11	Silty clay---	CH	A-7	0	0	100	100	95-100	90-95	54-73	29-40
	11-21	Silty clay---	CH	A-7	0	0	100	100	95-100	90-95	53-72	29-40
	21-30	Silty clay---	CH	A-7	0	0	100	100	95-100	90-95	52-70	29-40
	30-40	Silty clay---	CH	A-7	0	0	100	100	95-100	85-95	46-68	25-41
	40-60	Silty clay---	CH	A-7	0	0	100	100	95-100	85-95	46-67	25-41

Table 17.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
3775:												
Muir	0-4	Silt loam	CL	A-6	0	0	100	100	90-100	70-90	33-46	12-19
	4-16	Silt loam	CL	A-6	0	0	100	100	90-100	70-90	33-46	12-19
	16-24	Silt loam	CL	A-6, A-7-6	0	0	100	100	90-100	70-90	30-51	12-25
	24-44	Silt loam	CL	A-6, A-7-6	0	0	100	100	90-100	70-90	30-51	12-25
	44-60	Silt loam	CL	A-6, A-7-6	0	0	100	100	90-100	70-90	28-46	12-25
3827:												
Crete	0-6	Silty clay loam	CL	A-7-6	0	0	100	100	97-100	88-99	39-54	16-25
	6-14	Silty clay loam	CL	A-7-6	0	0	100	100	97-100	96-99	40-52	19-25
	14-30	Silty clay	CH	A-7-6	0	0	100	100	97-100	96-99	47-70	25-40
	30-42	Silty clay loam	CL, CH	A-7-6	0	0	100	100	97-100	96-99	41-57	21-33
	42-60	Silty clay loam	CL	A-7-6	0	0	100	100	97-100	88-99	35-52	17-29
3828:												
Crete	0-6	Silty clay loam	CL	A-7-6	0	0	100	100	97-100	88-99	39-54	16-25
	6-11	Silty clay loam	CL	A-7-6	0	0	100	100	97-100	96-99	40-52	19-25
	11-27	Silty clay	CH	A-7-6	0	0	100	100	97-100	96-99	47-70	25-40
	27-40	Silty clay loam	---	---	0	0	100	100	97-100	96-99	41-60	21-33
	40-60	Silty clay loam	---	---	0	0	100	100	97-100	88-99	36-52	17-29
3830:												
Crete	0-6	Silty clay loam	CL	A-7-6	0	0	100	100	97-100	88-99	39-54	16-25
	6-16	Silty clay	CH	A-7-6	0	0	100	100	97-100	96-99	47-70	25-40
	16-29	Silty clay loam	CL, CH	A-7-6	0	0	100	100	97-100	96-99	41-60	21-33
	29-46	Silty clay loam	CL	A-7-6	0	0	100	100	97-100	88-99	36-52	17-29
	46-60	Silt loam	CL	A-7-6	0	0	100	100	97-100	88-99	35-47	17-25
3844:												
Geary	0-8	Silt loam	CL	A-4, A-6	0	0	100	100	90-100	60-97	28-46	9-19
	8-18	Silt loam	CL	A-6	0	0	100	100	90-100	60-97	32-48	13-22
	18-25	Silty clay loam	CL	A-7-6, A-6	0	0	100	100	90-100	60-97	39-52	19-27
	25-48	Silty clay loam	CL	A-6, A-7-6	0	0	100	100	90-100	60-97	38-51	19-26
	48-60	Silty clay loam	CL	A-6, A-7	0	0	100	100	90-100	60-97	31-47	13-24
3845:												
Geary	0-6	Silt loam	CL	A-4, A-6	0	0	100	100	90-100	60-97	28-46	9-19
	6-10	Silt loam	CL	A-6	0	0	100	100	90-100	60-97	32-48	13-22
	10-16	Silty clay loam	CL	A-7-6, A-6	0	0	100	100	90-100	60-97	39-52	19-27
	16-38	Silty clay loam	CL	A-6, A-7-6	0	0	100	100	90-100	60-97	38-51	19-26
	38-60	Silty clay loam	CL	A-6, A-7	0	0	100	100	90-100	60-97	31-47	13-24
3880:												
Holder	0-8	Silt loam	CL	A-6, A-4	0	0	100	100	90-100	60-97	28-46	9-19
	8-14	Silt loam	CL	A-6, A-4	0	0	100	100	90-100	60-97	28-46	9-21
	14-45	Silty clay loam	CL	A-7-6, A-6	0	0	100	100	90-100	60-97	40-49	20-25
	45-58	Silty clay loam	CL	A-6	0	0	100	100	90-100	60-97	26-43	10-21
	58-60	Silt loam	CL	A-6	0	0	100	100	90-100	60-97	26-41	10-21
3882:												
Holder	0-8	Silt loam	CL	A-6, A-4	0	0	100	100	90-100	60-97	28-46	9-19
	8-14	Silt loam	CL	A-6, A-4	0	0	100	100	90-100	60-97	28-46	9-21
	14-45	Silty clay loam	CL	A-7-6, A-6	0	0	100	100	90-100	60-97	40-49	20-25
	45-58	Silty clay loam	CL	A-6	0	0	100	100	90-100	60-97	26-43	10-21
	58-60	Silt loam	CL	A-6	0	0	100	100	90-100	60-97	26-41	10-21
3890:												
Ladysmith	0-7	Silty clay loam	CL	A-7-6	0	0	100	100	95-100	85-95	43-54	20-25
	7-15	Silty clay	CH	A-7	0	0	100	100	90-100	75-95	53-76	29-44
	15-30	Silty clay	CH	A-7	0	0	100	100	90-100	75-95	53-76	29-44
	30-38	Silty clay	CH	A-7	0	0	100	100	90-100	75-95	53-76	29-44
	38-60	Silty clay	CH	A-7-6	0	0	100	100	95-100	85-95	46-68	25-41

Table 17.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
3934:												
Valentine------	0-5	Loamy fine sand	SM, SP-SM	A-2	0	0	100	100	75-100	10-55	0-22	NP-6
	5-50	Loamy sand-----	SM	A-2	0	0	100	100	50-75	15-30	0-21	NP-6
	50-60	Sand----------	SM	A-2-4, A-3	0	0	100	100	50-70	5-15	0-18	NP-3
3936:												
Wells----------	0-12	Loam----------	CL	A-6	0	0	100	100	85-95	60-75	30-46	12-19
	12-19	Clay loam------	CL	A-6, A-7	0	0	100	100	80-100	35-80	38-47	19-25
	19-37	Clay loam------	CL	A-6, A-7	0	0	100	100	80-100	35-80	38-47	19-25
	37-51	Sandy clay loam	CL	A-6, A-7	0	0	100	100	80-90	35-55	38-47	19-25
	51-63	Loam----------	CL	A-6	0	0	100	100	90-100	60-80	26-42	10-21
Ortello--------	0-6	Sandy loam-----	SC, SM	A-4	0	0	100	100	60-70	30-40	18-30	2-9
	6-15	Sandy loam-----	SC, SM	A-4	0	0	100	100	60-70	30-40	18-30	2-9
	15-34	Sandy loam-----	ML, CL, CL-ML	A-4	0	0	100	100	60-85	30-55	17-28	2-9
	34-60	Sandy loam-----	ML, CL, CL-ML	A-4	0	0	100	100	60-85	30-55	17-28	2-9
3938:												
Wells----------	0-12	Loam----------	CL	A-6	0	0	100	100	85-95	60-75	30-46	12-19
	12-19	Clay loam------	CL	A-6, A-7	0	0	100	100	80-100	35-80	38-47	19-25
	19-37	Clay loam------	CL	A-6, A-7	0	0	100	100	80-100	35-80	38-47	19-25
	37-51	Sandy clay loam	CL	A-7, A-6	0	0	100	100	80-90	35-55	38-47	19-25
	51-63	Loam----------	CL	A-6	0	0	100	100	90-100	60-80	26-42	10-21
Ortello--------	0-6	Sandy loam-----	SC, SM	A-4	0	0	100	100	60-70	30-40	18-30	2-9
	6-15	Sandy loam-----	SC, SM	A-4	0	0	100	100	60-70	30-40	18-30	2-9
	15-34	Sandy loam-----	ML, CL	A-4	0	0	100	100	60-85	30-55	17-28	2-9
	34-60	Sandy loam-----	ML, CL	A-4	0	0	100	100	60-85	30-55	17-28	2-9
4150:												
Kahola---------	0-24	Silt loam------	CL	A-6	0	0	94-100	91-100	82-100	64-90	33-46	12-19
	24-36	Silt loam------	CL	A-6	0	0	94-100	91-100	82-100	64-90	30-46	12-19
	36-44	Silt loam------	CL	A-6, A-7	0	0	94-100	91-100	82-100	64-90	29-49	12-24
	44-60	Silt loam------	CL	A-6, A-7	0	0	94-100	91-100	82-100	64-90	29-48	12-25
4151:												
Kahola---------	0-24	Silt loam------	CL	A-6	0	0	94-100	91-100	82-100	64-90	33-46	12-19
	24-36	Silt loam------	CL	A-6	0	0	94-100	91-100	82-100	64-90	30-46	12-19
	36-44	Silt loam------	CL	A-6, A-7	0	0	94-100	91-100	82-100	64-90	29-49	12-24
	44-60	Silt loam------	CL	A-6, A-7	0	0	94-100	91-100	82-100	64-90	29-48	12-25
4530:												
Benfield-------	0-5	Silty clay loam	CL	A-7	0	0-5	93-100	91-100	86-100	77-95	41-57	19-24
	5-10	Silty clay loam	CH	A-7-6	0	0-5	80-100	76-100	72-100	65-95	47-59	25-32
	10-19	Gravelly silty clay.	CH	A-7-6	0	0-5	60-80	50-74	45-74	45-70	47-64	25-36
	19-34	Silty clay-----	CH	A-7-6	0	0-5	80-92	76-90	72-90	68-86	46-68	25-40
	34-38	Silty clay-----	CH	A-7-6	0	0	100	100	95-100	90-95	50-71	29-44
	38-56	Weathered bedrock.	---	---	---	---	---	---	---	---	---	---
Florence-------	0-5	Gravelly silt loam.	ML, GM	A-7	0	0-10	58-92	48-90	43-90	34-81	43-62	16-24
	5-14	Very gravelly silty clay.	GC, CH	A-7	0	0-40	30-80	11-75	10-75	8-70	50-77	25-40
	14-48	Very cobbly clay.	CH, GC	A-7	0	25-50	42-68	26-61	23-61	20-58	59-92	36-59
	48-56	Extremely cobbly clay.	CH, GC	A-2-7	0	50-90	20-88	3-85	3-85	3-81	59-88	36-59
	56-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	---

Table 17.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
4550:												
Clime	0-2	Stony silty clay loam.	CL		0-5	0-12	84-100	79-100	75-100	67-95	46-57	22-26
	2-9	Silty clay	CH, CL	A-7-6	0	0-12	84-100	79-100	75-100	67-95	43-62	23-34
	9-27	Silty clay	CH, CL	A-7-6	0	0	92-100	90-100	86-100	77-95	46-60	25-34
	27-33	Silty clay	CH, CL	A-7-6	0	0	100	100	95-100	77-95	45-59	25-34
	33-37	Weathered bedrock.	---	---	0	0	---	---	---	---	---	---
4590:												
Clime	0-12	Silty clay loam	CL	A-7	0	0-5	86-100	82-100	78-100	70-95	46-57	22-26
	12-26	Silty clay	CH, CL	A-7-6	0	0-5	86-100	82-100	78-100	70-95	46-60	25-34
	26-30	Silty clay	CH, CL	A-7-6	0	0	86-100	82-100	78-100	70-95	45-59	25-34
	30-34	Weathered bedrock.	---	---	---	---	---	---	---	---	---	---
Sogn	0-9	Silty clay loam	CL	A-6, A-7-6	0	0-10	85-100	82-100	78-100	70-95	39-51	19-25
	9-13	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	---
4673:												
Irwin	0-6	Silty clay loam	CL	A-7-6	0	0	93-100	91-100	86-100	77-95	42-53	19-25
	6-13	Silty clay loam	CL	A-7-6	0	0	93-100	91-100	86-100	77-95	41-51	19-25
	13-30	Silty clay	CH	A-7-6	0	0	93-100	91-100	82-100	68-95	51-73	29-44
	30-41	Silty clay	CH	A-7-6	0	0	93-100	91-100	82-100	68-95	50-71	29-44
	41-72	Silty clay	CH	A-7-6	0	0	93-100	91-100	86-100	77-95	46-62	25-37
4735:												
Konza	0-6	Silty clay loam	CL	A-7	0	0	100	100	95-100	85-95	35-58	13-25
	6-28	Silty clay	CH	A-7	0	0	100	100	95-100	80-95	58-72	33-40
	28-42	Silty clay	CH	A-7-6	0	0	100	100	95-100	85-95	47-58	25-33
	42-50	Silty clay loam	CL	A-7-6	0	0	100	100	95-100	85-95	41-52	21-29
	50-70	Silty clay loam	CH	A-7-6	0	0	100	100	95-100	85-95	46-57	25-33
	70-89	Clay	CH	A-7-6	0	0-5	93-100	91-100	82-100	68-95	56-77	33-48
4781:												
Tully	0-12	Silty clay loam	CL	A-7	0	0	93-100	91-100	86-100	77-95	44-60	19-27
	12-21	Silty clay loam	CL	A-7	0	0	93-100	91-100	86-100	77-95	44-58	21-28
	21-31	Silty clay	CH	A-7	0	0	93-100	91-100	86-100	82-95	52-71	29-40
	31-40	Silty clay	CH	A-7-6	0	0	93-100	91-100	86-100	82-95	51-69	29-40
	40-52	Silty clay	CH	A-7-6	0	0	93-100	91-100	86-100	82-95	51-67	29-40
	52-60	Silty clay	CH, CL	A-7-6	0	0	93-100	91-100	86-100	77-95	46-56	25-32
4783:												
Tully	0-12	Silty clay loam	CL	A-7	0	0	93-100	91-100	86-100	77-95	44-60	19-27
	12-21	Silty clay loam	CL	A-7	0	0	93-100	91-100	86-100	77-95	44-58	21-28
	21-31	Silty clay	CH	A-7	0	0	93-100	91-100	86-100	82-95	52-71	29-40
	31-40	Silty clay	CH	A-7-6	0	0	93-100	91-100	86-100	82-95	51-69	29-40
	40-52	Silty clay	CH	A-7-6	0	0	93-100	91-100	86-100	82-95	51-67	29-40
	52-60	Silty clay	CH, CL	A-7-6	0	0	93-100	91-100	86-100	77-95	46-56	25-32
7031:												
Eudora	0-7	Silt loam	CL, CL-ML	A-4	0	0	100	100	90-100	70-90	23-37	6-13
	7-14	Silt loam	CL	A-4	0	0	100	100	90-100	70-90	23-37	6-13
	14-19	Silt loam	CL	A-4	0	0	100	100	90-100	70-90	16-33	2-12
	19-26	Silt loam	CL, CL-ML, ML	A-4	0	0	100	100	85-100	50-90	16-30	2-12
	26-60	Very fine sandy loam.	CL	A-4	0	0	100	100	85-100	50-90	16-29	2-12
7081:												
Sarpy	0-9	Loamy fine sand	SM	A-2-4	0	0	100	100	70-85	28-45	0-18	NP-2
	9-60	Fine sand	SM, SP-SM	A-2-4	0	0	100	100	50-85	5-45	0-18	NP-2

Table 17.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
7082:												
Sarpy----------	0-4	Gravelly loamy coarse sand.	SM	A-2-4	0	0	72-92	60-82	30-62	9-25	0-18	NP-2
	4-10	Sand----------	SM	A-2-4	0	0	88-100	82-100	40-70	5-15	0-17	NP-2
	10-60	Coarse sand----	SM	A-2-4	0	0	92-100	82-100	40-70	5-15	0-17	NP-2
7170:												
Reading--------	0-8	Silt loam------	CL	A-6	0	0	100	100	90-100	70-90	33-47	12-19
	8-20	Silty clay loam	CL	A-7	0	0	100	100	95-100	85-95	41-48	19-21
	20-52	Silty clay loam	CL	A-7	0	0	100	100	95-100	85-95	41-51	21-25
	52-60	Silty clay loam	CL	A-7	0	0	100	100	95-100	85-95	41-52	21-29
7173:												
Reading--------	0-8	Silty clay loam	CL	A-7	0	0	100	100	95-100	85-95	41-48	19-21
	8-20	Silty clay loam	CL	A-7	0	0	100	100	95-100	85-95	41-48	19-21
	20-52	Silty clay loam	CL	A-7	0	0	100	100	95-100	85-95	41-51	21-25
	52-60	Silty clay loam	CL	A-7	0	0	100	100	95-100	85-95	41-52	21-29
7740:												
Haynie---------	0-10	Stratified silt loam.	CL	A-6, A-4	0	0	100	100	85-100	70-100	28-42	9-17
	10-60	Stratified silt loam.	CL	A-6	0	0	100	100	85-100	70-100	25-36	10-17
9971. Arents, earthen dam												
9983. Gravel pits and quarries												
9986. Miscellaneous water												
9988. Orthents												
9999. Water												

Table 18.--Physical Properties of the Soils

(Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodibility index" apply only to the surface layer. Absence of an entry indicates that data were not estimated.)

Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Permeability (Ksat)	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										K	Kf	T		
	In	Pct	Pct	Pct	g/cc	In/hr	In/in	Pct	Pct					
2177:														
McCook-------	0-16	14	70	15-20	1.20-1.40	0.60-2.00	0.20-0.24	1.6-2.6	1.0-3.0	.32	.32	5	4L	86
	16-25	14	70	15-20	1.20-1.40	0.60-2.00	0.17-0.22	1.6-2.6	0.5-2.0	.32	.32			
	25-60	60	26	10-18	1.30-1.70	0.60-2.00	0.17-0.22	0.5-2.2	0.1-2.9	---	---			
2181:														
McCook-------	0-12	14	70	15-20	1.20-1.40	0.60-2.00	0.20-0.24	1.6-2.6	1.0-3.0	.32	.32	5	4L	86
	12-23	14	70	15-20	1.20-1.40	0.60-2.00	0.17-0.22	1.6-2.6	0.5-2.0	.32	.32			
	23-60	60	26	10-18	1.30-1.70	0.60-2.00	0.17-0.22	0.5-2.2	0.1-2.9	---	---			
Smokyhill----	0-6	25	53	18-27	1.20-1.30	0.60-2.00	0.22-0.24	2.2-4.1	2.0-4.0	.32	.32	5	4L	86
	6-14	18	48	30-40	1.10-1.30	0.20-0.60	0.12-0.20	4.7-6.8	1.0-2.0	.37	.37			
	14-30	18	43	35-45	1.10-1.50	0.06-0.20	0.11-0.20	5.8-7.0	0.5-1.0	---	---			
	30-72	29	54	10-18	1.30-1.70	0.60-2.00	0.17-0.22	0.0-2.2	0.1-2.0	---	---			
2347:														
McCook-------	0-16	14	70	15-20	1.20-1.40	0.60-2.00	0.20-0.24	1.6-2.6	1.0-3.0	.32	.32	5	4L	86
	16-25	14	70	15-20	1.20-1.40	0.60-2.00	0.17-0.22	1.6-2.6	0.5-2.0	.32	.32			
	25-60	60	26	10-18	1.30-1.70	0.60-2.00	0.17-0.22	0.5-2.2	0.1-2.9	---	---			
3400:														
Longford-----	0-11	42	37	15-27	1.30-1.40	0.60-2.00	0.20-0.22	1.6-4.1	1.0-4.0	.28	.28	5	6	48
	11-16	34	36	28-40	1.35-1.50	0.20-0.60	0.14-0.20	4.9-7.9	1.0-2.0	.32	.32			
	16-46	30	32	35-40	1.35-1.50	0.06-0.20	0.14-0.20	5.8-7.9	0.5-2.0	---	---			
	46-54	34	33	20-35	1.30-1.40	0.20-0.60	0.15-0.20	2.6-5.8	0.5-1.0	---	---			
	54-60	38	36	20-35	1.30-1.40	0.20-0.60	0.15-0.20	2.6-5.8	0.5-1.0	---	---			
3545:														
Hobbs--------	0-8	11	68	15-27	1.20-1.40	0.60-2.00	0.21-0.24	1.6-4.1	2.0-4.0	.32	.32	5	6	48
	8-24	11	68	15-27	1.20-1.40	0.60-2.00	0.00-0.20	1.6-4.1	0.5-1.0	.32	.32			
	24-44	10	68	15-30	1.20-1.40	0.60-2.00	0.18-0.22	1.6-4.7	0.5-1.0	---	---			
	44-60	10	68	15-30	1.20-1.40	0.60-2.00	0.18-0.22	1.6-4.7	0.5-1.0	---	---			
3561:														
Hobbs--------	0-8	11	68	15-27	1.20-1.40	0.60-2.00	0.21-0.24	1.6-4.1	2.0-4.0	.32	.32	5	6	48
	8-24	11	68	15-27	1.20-1.40	0.60-2.00	0.00-0.20	1.6-4.1	0.5-1.0	.32	.32			
	24-44	10	68	15-30	1.20-1.40	0.60-2.00	0.18-0.22	1.6-4.7	0.5-1.0	---	---			
	44-60	10	68	15-30	1.20-1.40	0.60-2.00	0.18-0.22	1.6-4.7	0.5-1.0	---	---			
3617:														
Solomon------	0-8	6	48	40-55	1.35-1.45	0.00-0.06	0.12-0.14	7.9-11.7	2.0-4.0	.28	.28	5	4L	86
	8-19	6	48	40-55	1.35-1.45	0.00-0.06	0.12-0.14	7.9-11.7	2.0-4.0	.28	.28			
	19-36	11	39	40-55	1.35-1.45	0.00-0.06	0.08-0.12	7.9-11.7	1.0-2.0	---	---			
	36-50	11	39	40-55	1.35-1.45	0.00-0.06	0.08-0.12	7.9-11.7	1.0-2.0	---	---			
	50-60	11	39	40-55	1.35-1.45	0.00-0.06	0.08-0.12	7.9-11.7	1.0-2.0	---	---			
3633:														
Sutphen------	0-6	6	47	35-55	1.35-1.45	0.00-0.06	0.12-0.14	6.7-11.7	2.0-4.0	.28	.28	5	4	86
	6-11	6	47	40-55	1.35-1.45	0.00-0.06	0.12-0.14	7.9-11.7	1.5-4.0	.28	.28			
	11-21	6	47	40-55	1.35-1.45	0.00-0.06	0.12-0.14	7.9-11.7	1.0-3.0	---	---			
	21-30	6	47	40-55	1.35-1.45	0.00-0.06	0.10-0.14	7.9-11.7	0.8-2.0	---	---			
	30-40	7	48	35-55	1.35-1.45	0.06-0.20	0.10-0.18	6.7-11.7	0.2-1.0	---	---			
	40-60	7	48	35-55	1.35-1.45	0.06-0.20	0.10-0.18	6.7-11.7	0.2-0.8	---	---			

Table 18.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Permeability (Ksat)	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										K	Kf	T		
	In	Pct	Pct	Pct	g/cc	In/hr	In/in	Pct	Pct					
3775:														
Muir---------	0-4	10	68	18-27	1.30-1.45	0.60-2.00	0.22-0.24	2.2-4.1	2.0-4.0	.32	.32	5	6	48
	4-16	10	68	18-27	1.30-1.45	0.60-2.00	0.22-0.24	2.2-4.1	2.0-4.0	.32	.32			
	16-24	9	64	18-35	1.30-1.50	0.60-2.00	0.18-0.22	2.2-5.8	1.0-3.0	---	---			
	24-44	9	64	18-35	1.30-1.50	0.60-2.00	0.18-0.22	2.2-5.8	1.0-3.0	---	---			
	44-60	9	64	18-35	1.30-1.50	0.60-2.00	0.18-0.22	2.2-5.8	0.0-0.5	---	---			
3827:														
Crete--------	0-6	7	63	24-35	1.20-1.40	0.20-0.60	0.21-0.23	3.9-7.0	2.0-4.0	.37	.37	5	7	38
	6-14	9	60	27-35	1.20-1.40	0.20-0.60	0.21-0.23	5.0-7.0	1.0-3.0	.37	.37			
	14-30	3	52	35-55	1.10-1.30	0.06-0.20	0.12-0.20	7.0-12.0	0.5-2.0	---	---			
	30-42	3	59	30-45	1.10-1.30	0.06-0.20	0.12-0.20	5.0-9.0	0.2-0.8	---	---			
	42-60	4	60	25-40	1.10-1.30	0.20-0.60	0.12-0.20	4.1-8.0	0.0-0.5	---	---			
3828:														
Crete--------	0-6	7	63	24-35	1.20-1.40	0.20-0.60	0.21-0.23	3.9-7.0	2.0-4.0	.37	.37	5	7	38
	6-11	9	60	27-35	1.20-1.40	0.20-0.60	0.21-0.23	5.0-7.0	1.0-3.0	.37	.37			
	11-27	3	52	35-55	1.10-1.30	0.06-0.20	0.12-0.20	7.0-12.0	0.5-2.0	---	---			
	27-40	3	59	30-45	1.10-1.30	0.06-0.20	0.12-0.20	5.0-9.0	0.5-2.0	---	---			
	40-60	4	60	25-40	1.10-1.30	0.20-0.60	0.12-0.20	4.1-8.0	0.2-0.8	---	---			
3830:														
Crete--------	0-6	7	63	24-35	1.20-1.40	0.20-0.60	0.21-0.23	3.9-7.0	2.0-4.0	.37	.37	5	7	38
	6-16	3	52	35-55	1.10-1.30	0.06-0.20	0.12-0.20	7.0-12.0	0.5-2.0	.37	.37			
	16-29	3	59	30-45	1.10-1.30	0.06-0.20	0.12-0.20	5.0-9.0	0.5-2.0	---	---			
	29-46	4	60	25-40	1.10-1.30	0.20-0.60	0.12-0.20	4.1-8.0	0.2-0.8	---	---			
	46-60	4	70	25-35	1.10-1.30	0.20-0.60	0.12-0.20	4.1-8.0	0.0-0.5	---	---			
3844:														
Geary--------	0-8	11	68	15-27	1.12-1.40	0.60-2.00	0.22-0.24	1.6-4.1	1.0-4.0	.32	.32	5	6	48
	8-18	9	65	20-32	1.12-1.40	0.60-2.00	0.20-0.22	2.6-5.1	1.0-3.0	.32	.32			
	18-25	7	59	27-38	1.35-1.50	0.60-2.00	0.15-0.20	4.1-6.4	1.0-2.0	---	---			
	25-48	6	62	27-38	1.35-1.50	0.60-2.00	0.15-0.20	4.1-6.4	0.5-1.5	---	---			
	48-60	7	63	20-35	1.35-1.50	0.60-2.00	0.15-0.20	2.6-5.8	0.5-1.0	---	---			
3845:														
Geary--------	0-6	11	68	15-27	1.12-1.40	0.60-2.00	0.22-0.24	1.6-4.1	1.0-4.0	.32	.32	5	6	48
	6-10	9	65	20-32	1.12-1.40	0.60-2.00	0.20-0.22	2.6-5.1	1.0-3.0	.32	.32			
	10-16	7	59	27-38	1.35-1.50	0.60-2.00	0.15-0.20	4.1-6.4	1.0-2.0	---	---			
	16-38	6	62	27-38	1.35-1.50	0.60-2.00	0.15-0.20	4.1-6.4	0.5-1.5	---	---			
	38-60	7	63	20-35	1.35-1.50	0.60-2.00	0.15-0.20	2.6-5.8	0.5-1.0	---	---			
3880:														
Holder-------	0-8	11	68	15-27	1.40-1.60	0.60-2.00	0.22-0.24	1.6-4.1	1.0-4.0	.32	.32	5	6	48
	8-14	9	65	15-30	1.40-1.60	0.60-2.00	0.22-0.24	1.6-4.7	1.0-3.0	.32	.32			
	14-45	7	61	28-35	1.20-1.40	0.60-2.00	0.18-0.20	4.3-5.8	0.8-2.0	---	---			
	45-58	7	66	15-30	1.40-1.60	0.60-2.00	0.20-0.22	1.6-4.7	0.5-1.5	---	---			
	58-60	10	68	15-30	1.40-1.60	0.60-2.00	0.20-0.22	1.6-4.7	0.1-0.5	---	---			
3882:														
Holder-------	0-8	11	68	15-27	1.40-1.60	0.60-2.00	0.22-0.24	1.6-4.1	1.0-4.0	.32	.32	5	6	48
	8-14	9	65	15-30	1.40-1.60	0.60-2.00	0.22-0.24	1.6-4.7	1.0-3.0	.32	.32			
	14-45	7	61	28-35	1.20-1.40	0.60-2.00	0.18-0.20	4.3-5.8	0.8-2.0	---	---			
	45-58	7	66	15-30	1.40-1.60	0.60-2.00	0.20-0.22	1.6-4.7	0.5-1.5	---	---			
	58-60	10	68	15-30	1.40-1.60	0.60-2.00	0.20-0.22	1.6-4.7	0.1-0.5	---	---			
3890:														
Ladysmith----	0-7	6	62	28-35	1.35-1.45	0.20-0.60	0.21-0.23	5.0-7.0	2.0-4.0	.37	.37	5	7	38
	7-15	5	45	40-60	1.35-1.50	0.00-0.06	0.10-0.15	8.0-13.0	1.0-3.0	.37	.37			
	15-30	5	45	40-60	1.35-1.50	0.00-0.06	0.10-0.15	8.0-13.0	1.0-3.0	---	---			
	30-38	5	45	40-60	1.35-1.50	0.00-0.06	0.10-0.15	8.0-13.0	1.0-3.0	---	---			
	38-60	7	48	35-55	1.40-1.60	0.00-0.20	0.10-0.19	7.0-12.0	0.0-1.0	---	---			

Table 18.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Permeability (Ksat)	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										K	Kf	T		
	In	Pct	Pct	Pct	g/cc	In/hr	In/in	Pct	Pct					
3934:														
Valentine----	0-5	87	7	2-10	1.70-1.90	5.95-19.98	0.07-0.12	0.0-0.0	0.5-1.0	.17	.17	5	2	134
	5-50	87	7	2-10	1.70-1.90	5.95-19.98	0.09-0.11	0.0-0.0	0.0-0.5	.17	.17			
	50-60	96	1	0-6	1.70-1.90	5.95-19.98	0.05-0.07	0.0-0.0	0.0-0.5	---	---			
3936:														
Wells--------	0-12	40	37	18-27	1.35-1.50	0.60-2.00	0.20-0.22	2.2-4.1	1.0-4.0	.28	.28	5	6	48
	12-19	35	34	27-35	1.35-1.60	0.60-2.00	0.15-0.19	4.1-5.8	0.5-1.0	.32	.32			
	19-37	35	34	27-35	1.35-1.60	0.60-2.00	0.15-0.19	4.1-5.8	0.5-1.0	---	---			
	37-51	55	14	27-35	1.35-1.60	0.60-2.00	0.15-0.19	4.1-5.8	0.5-1.0	---	---			
	51-63	38	42	15-30	1.35-1.50	0.60-2.00	0.15-0.19	1.6-4.7	0.5-1.0	---	---			
Ortello------	0-6	67	23	5-15	1.40-1.60	2.00-6.00	0.13-0.18	0.0-1.6	1.0-2.0	.20	.20	4	3	86
	6-15	67	23	5-15	1.40-1.60	2.00-6.00	0.13-0.18	0.0-1.6	1.0-2.0	.20	.20			
	15-34	67	23	5-15	1.40-1.60	2.00-6.00	0.12-0.17	0.0-1.6	0.5-1.0	---	---			
	34-60	67	23	5-15	1.40-1.60	2.00-6.00	0.11-0.16	0.0-1.6	0.5-1.0	---	---			
3938:														
Wells--------	0-12	40	37	18-27	1.35-1.50	0.60-2.00	0.20-0.22	2.2-4.1	1.0-4.0	.28	.28	5	6	48
	12-19	35	34	27-35	1.35-1.60	0.60-2.00	0.15-0.19	4.1-5.8	0.5-1.0	.32	.32			
	19-37	35	34	27-35	1.35-1.60	0.60-2.00	0.15-0.19	4.1-5.8	0.5-1.0	---	---			
	37-51	55	14	27-35	1.35-1.60	0.60-2.00	0.15-0.19	4.1-5.8	0.5-1.0	---	---			
	51-63	38	42	15-30	1.35-1.50	0.60-2.00	0.15-0.19	1.6-4.7	0.5-1.0	---	---			
Ortello------	0-6	67	23	5-15	1.40-1.60	2.00-6.00	0.13-0.18	0.0-1.6	1.0-2.0	.20	.20	4	3	86
	6-15	67	23	5-15	1.40-1.60	2.00-6.00	0.13-0.18	0.0-1.6	1.0-2.0	.20	.20			
	15-34	67	23	5-15	1.40-1.60	2.00-6.00	0.12-0.17	0.0-1.6	0.5-1.0	---	---			
	34-60	67	23	5-15	1.40-1.60	2.00-6.00	0.11-0.16	0.0-1.6	0.5-1.0	---	---			
4150:														
Kahola-------	0-24	10	68	18-27	1.35-1.40	0.60-2.00	0.21-0.24	2.2-4.1	2.0-4.0	.32	.32	5	6	48
	24-36	10	68	18-27	1.35-1.40	0.60-2.00	0.21-0.24	2.2-4.1	1.0-4.0	.32	.32			
	36-44	9	64	18-35	1.35-1.40	0.60-2.00	0.17-0.22	2.2-5.8	0.5-2.0	---	---			
	44-60	9	64	18-35	1.35-1.40	0.60-2.00	0.17-0.22	2.2-5.8	0.5-1.5	---	---			
4151:														
Kahola-------	0-24	10	68	18-27	1.35-1.40	0.60-2.00	0.21-0.24	2.2-4.1	2.0-4.0	.32	.32	5	6	48
	24-36	10	68	18-27	1.35-1.40	0.60-2.00	0.21-0.24	2.2-4.1	1.0-4.0	.32	.32			
	36-44	9	64	18-35	1.35-1.40	0.60-2.00	0.17-0.22	2.2-5.8	0.5-2.0	---	---			
	44-60	9	64	18-35	1.35-1.40	0.60-2.00	0.17-0.22	2.2-5.8	0.5-1.5	---	---			
4530:														
Benfield-----	0-5	8	61	27-35	1.30-1.50	0.20-0.60	0.21-0.24	4.1-5.8	2.0-6.0	.37	.43	3	7	38
	5-10	7	54	35-45	1.35-1.50	0.06-0.20	0.11-0.20	5.8-7.9	1.0-2.0	.24	.37			
	10-19	7	48	35-50	1.35-1.50	0.06-0.20	0.11-0.20	5.8-8.9	1.0-2.0	---	---			
	19-34	5	45	35-55	1.35-1.50	0.06-0.20	0.08-0.16	5.8-10.0	0.5-1.5	---	---			
	34-38	5	45	40-60	1.35-1.50	0.06-0.20	0.08-0.16	6.8-11.0	0.0-1.0	---	---			
	38-56			---	---	---	---	---	---	---	---			
Florence-----	0-5	12	62	24-35	1.25-1.35	0.60-2.00	0.05-0.20	3.9-6.7	4.0-8.0	.20	.64	3	8	0
	5-14	7	48	35-55	1.35-1.55	0.20-0.60	0.03-0.11	6.7-11.7	2.0-6.0	.15	.24			
	14-48	10	25	50-80	1.35-1.55	0.20-0.60	0.03-0.12	6.0-11.0	0.8-3.0	---	---			
	48-56	10	25	50-80	1.35-1.55	0.20-0.60	0.03-0.12	6.0-11.0	0.5-1.0	---	---			
	56-60			---	---	---	---	---	---	---	---			
4550:														
Clime--------	0-2	8	56	32-40	1.00-1.45	0.20-0.60	0.21-0.23	5.1-6.8	2.0-4.0	.24	.49	3	8	0
	2-9	7	52	32-50	1.30-1.45	0.06-0.60	0.12-0.23	5.1-8.9	0.5-2.0	.17	.28			
	9-27	6	47	35-50	1.30-1.50	0.06-0.20	0.09-0.20	5.8-8.9	0.5-1.0	---	---			
	27-33	8	50	35-50	1.30-1.50	0.06-0.20	0.08-0.20	5.8-8.9	0.0-0.5	---	---			
	33-37			---	---	---	---	---	---	---	---			

Table 18.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Permeability (Ksat)	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										K	Kf	T		
	In	Pct	Pct	Pct	g/cc	In/hr	In/in	Pct	Pct					
4590:														
Clime--------	0-12	8	56	32-40	1.00-1.45	0.20-0.60	0.21-0.23	5.1-6.8	2.0-4.0	.32	.32	3	4	86
	12-26	6	47	35-50	1.00-1.50	0.06-0.20	0.12-0.18	5.8-8.9	0.5-1.0	.24	.28			
	26-30	8	50	35-50	1.00-1.50	0.06-0.20	0.10-0.14	5.8-8.9	0.0-0.5	---	---			
	30-34			---	---	---	---	---	---	---	---			
Sogn---------	0-9	20	49	27-35	1.35-1.45	0.60-2.00	0.21-0.23	4.1-5.8	1.0-3.0	.32	.32	1	4L	86
	9-13			---	---	---	---	---	---	---	---			
4673:														
Irwin--------	0-6	10	58	28-35	1.35-1.45	0.20-0.60	0.21-0.23	4.3-5.8	2.0-4.0	.37	.37	5	7	38
	6-13	10	58	28-35	1.35-1.45	0.20-0.60	0.21-0.23	4.3-5.8	1.5-3.0	.37	.37			
	13-30	5	45	40-60	1.40-1.50	0.00-0.06	0.10-0.13	6.8-11.0	0.8-2.0	---	---			
	30-41	5	45	40-60	1.40-1.50	0.00-0.06	0.10-0.13	6.8-11.0	0.2-1.0	---	---			
	41-72	7	48	35-50	1.40-1.50	0.06-0.20	0.09-0.19	5.8-10.0	0.2-0.8	---	---			
4735:														
Konza--------	0-6	6	68	20-35	1.10-1.35	0.20-0.60	0.21-0.24	4.1-7.0	2.0-6.0	.37	.37	3	7	38
	6-28	2	48	45-55	1.10-1.40	0.00-0.06	0.09-0.13	9.0-12.0	1.0-3.0	.37	.37			
	28-42	3	57	35-45	1.10-1.50	0.06-0.20	0.11-0.20	7.0-9.0	0.5-1.0	---	---			
	42-50	3	62	30-40	1.10-1.50	0.06-0.20	0.18-0.20	5.0-8.0	0.2-0.8	---	---			
	50-70	4	57	35-45	1.30-1.50	0.06-0.20	0.11-0.20	7.0-9.0	0.1-0.8	---	---			
	70-89	5	39	45-65	1.30-1.50	0.00-0.06	0.08-0.12	9.0-14.0	0.0-0.5	---	---			
4781:														
Tully--------	0-12	10	57	28-38	1.35-1.45	0.20-0.60	0.21-0.23	4.3-6.4	3.0-6.0	.37	.37	5	7	38
	12-21	10	55	30-40	1.35-1.45	0.20-0.60	0.18-0.20	4.7-6.8	2.0-4.0	.37	.37			
	21-31	8	49	40-55	1.40-1.50	0.06-0.20	0.10-0.15	6.8-10.0	1.0-3.0	---	---			
	31-40	6	48	40-55	1.40-1.50	0.06-0.20	0.10-0.15	6.8-10.0	0.8-2.0	---	---			
	40-52	7	48	40-55	1.40-1.50	0.06-0.20	0.10-0.15	6.8-10.0	0.5-1.0	---	---			
	52-60	8	52	35-45	1.40-1.50	0.06-0.20	0.07-0.12	5.8-7.0	0.2-1.0	---	---			
4783:														
Tully--------	0-12	10	57	28-38	1.35-1.45	0.20-0.60	0.21-0.23	4.3-6.4	3.0-6.0	.37	.37	5	7	38
	12-21	10	55	30-40	1.35-1.45	0.20-0.60	0.18-0.20	4.7-6.8	2.0-4.0	.37	.37			
	21-31	8	49	40-55	1.40-1.50	0.06-0.20	0.10-0.15	6.8-10.0	1.0-3.0	---	---			
	31-40	6	48	40-55	1.40-1.50	0.06-0.20	0.10-0.15	6.8-10.0	0.8-2.0	---	---			
	40-52	7	48	40-55	1.40-1.50	0.06-0.20	0.10-0.15	6.8-10.0	0.5-1.0	---	---			
	52-60	8	52	35-45	1.40-1.50	0.06-0.20	0.07-0.12	5.8-7.0	0.2-1.0	---	---			
7031:														
Eudora-------	0-7	12	69	10-20	1.00-1.50	0.60-2.00	0.20-0.24	0.5-2.6	1.0-3.0	.32	.32	5	5	56
	7-14	14	73	10-20	1.20-1.50	0.60-2.00	0.20-0.24	0.5-2.6	1.0-3.0	.32	.32			
	14-19	21	69	5-18	1.20-1.50	0.60-2.00	0.20-0.22	0.0-2.2	0.0-2.0	---	---			
	19-26	22	70	5-18	1.30-1.50	2.00-6.00	0.14-0.22	0.0-2.2	0.0-1.0	---	---			
	26-60	63	29	5-18	1.30-1.50	2.00-6.00	0.14-0.22	0.0-2.2	0.0-0.5	---	---			
7081:														
Sarpy--------	0-9	80	16	2-5	1.30-1.70	5.95-19.98	0.10-0.12	0.0-0.0	0.5-1.0	.17	.17	5	2	134
	9-60	95	1	2-5	1.30-1.70	5.95-19.98	0.05-0.10	0.0-0.0	0.5-1.0	.15	.15			
7082:														
Sarpy--------	0-4	79	17	2-5	1.30-1.70	5.95-19.98	0.04-0.06	0.0-0.0	0.5-1.0	.15	.17	5	2	134
	4-10	95	1	2-5	1.30-1.70	5.95-19.98	0.06-0.08	0.0-0.0	0.0-0.5	.15	.24			
	10-60	92	4	2-5	1.30-1.70	5.95-19.98	0.02-0.04	0.0-0.0	0.0-0.5	---	---			
7170:														
Reading------	0-8	11	67	18-28	1.35-1.40	0.60-2.00	0.22-0.24	2.2-4.3	2.0-4.0	.32	.32	5	6	48
	8-20	7	64	27-30	1.35-1.40	0.20-0.60	0.21-0.23	3.0-4.7	2.0-4.0	.32	.32			
	20-52	7	61	30-35	1.40-1.50	0.20-0.60	0.18-0.20	4.7-5.8	0.5-3.0	---	---			
	52-60	8	56	30-40	1.40-1.50	0.20-0.60	0.13-0.20	4.7-6.8	0.5-1.0	---	---			

Table 18.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Permeability (Ksat)	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										K	Kf	T		
	In	Pct	Pct	Pct	g/cc	In/hr	In/in	Pct	Pct					
7173:														
Reading------	0-8	7	64	27-30	1.35-1.40	0.20-0.60	0.21-0.23	3.0-4.7	2.0-4.0	.32	.32	5	7	38
	8-20	7	64	27-30	1.35-1.40	0.20-0.60	0.21-0.23	3.0-4.7	2.0-4.0	.32	.32			
	20-52	7	61	30-35	1.40-1.50	0.20-0.60	0.18-0.20	4.7-5.8	0.5-3.0	---	---			
	52-60	8	56	30-40	1.40-1.50	0.20-0.60	0.13-0.20	4.7-6.8	0.5-1.0	---	---			
7740:														
Haynie-------	0-10	11	69	15-25	1.20-1.35	0.60-2.00	0.18-0.23	1.6-3.7	1.0-3.0	.37	.37	5	4L	86
	10-60	11	69	15-25	1.20-1.35	0.60-2.00	0.18-0.23	1.6-2.2	0.0-1.0	.43	.43			
9971. Arents, earthen dam														
9983. Gravel pits and quarries														
9986. Miscellaneous water														
9988. Orthents														
9999. Water														

Table 19.--Chemical Properties of the Soils

(Absence of an entry indicates that the data were not estimated.)

Map symbol and soil name	Depth	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	meq/100g	pH	Pct	Pct	mmhos/cm	
2177:							
McCook----------	0-16	10-15	6.6-8.4	0-3	0	0	0
	16-25	10-15	6.6-8.4	1-6	0	0	0
	25-60	7.0-14	6.6-8.4	3-10	0	0	0
2181:							
McCook----------	0-12	10-15	6.6-8.4	0-3	0	0	0
	12-23	10-15	6.6-8.4	1-6	0	0	0
	23-60	7.0-14	6.6-8.4	3-10	0	0	0
Smokyhill-------	0-6	12-19	6.6-7.8	0-5	0	0	0
	6-14	19-27	6.6-7.8	0-5	0	0	0
	14-30	22-30	7.4-8.4	0-5	0	0	0
	30-72	7.0-14	7.4-8.4	0-5	0	0	0
2347:							
McCook----------	0-16	10-15	6.6-8.4	0-3	0	0	0
	16-25	10-15	6.6-8.4	1-6	0	0	0
	25-60	7.0-14	6.6-8.4	3-10	0	0	0
3400:							
Longford--------	0-11	12-19	5.6-7.3	0	0	0	0
	11-16	12-16	5.1-7.3	0	0	0	0
	16-46	14-18	5.1-7.3	0	0	0	0
	46-54	15-24	6.1-7.8	0	0	0	0
	54-60	15-24	6.1-7.8	0	0	0	0
3545:							
Hobbs-----------	0-8	12-19	6.1-7.8	0	0	0	0
	8-24	12-19	6.1-7.8	0	0	0	0
	24-44	12-21	6.1-7.8	0-5	0	0	0
	44-60	12-21	6.1-7.8	0-5	0	0	0
3561:							
Hobbs-----------	0-8	12-19	6.1-7.8	0	0	0	0
	8-24	12-19	6.1-7.8	0	0	0	0
	24-44	12-21	6.1-7.8	0-5	0	0	0
	44-60	12-21	6.1-7.8	0-5	0	0	0
3617:							
Solomon---------	0-8	32-43	7.4-8.4	1-4	0	0	0
	8-19	32-43	7.4-8.4	1-4	0	0	0
	19-36	32-43	7.9-9.0	1-4	0	0	0
	36-50	32-43	7.9-9.0	1-4	0	0	0
	50-60	32-43	7.9-9.0	1-4	0	0	0
3633:							
Sutphen---------	0-6	28-43	6.1-8.4	0	0-3	0	0
	6-11	32-43	6.1-8.4	0	0-3	0	0
	11-21	32-43	6.1-8.4	0-3	0-3	0	0
	21-30	32-43	6.6-8.4	0-3	0-3	0	0
	30-40	28-43	7.4-8.4	1-3	0-3	0	0
	40-60	28-43	7.4-8.4	1-3	0-3	0	0
3775:							
Muir------------	0-4	12-19	5.6-7.3	0	0	0	0
	4-16	12-19	5.6-7.3	0	0	0	0
	16-24	12-24	6.1-7.3	0	0	0	0
	24-44	12-24	6.1-7.3	0-2	0	0	0
	44-60	12-24	6.1-8.4	0-2	0	0	0

Table 19.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	meq/100g	pH	Pct	Pct	mmhos/cm	
3827:							
Crete----------	0-6	20-29	5.6-6.0	0	0	0	0
	6-14	22-29	5.6-6.0	0	0	0	0
	14-30	29-44	6.1-7.3	0	0	0	0
	30-42	25-36	6.1-7.3	0-5	0	0	0
	42-60	20-33	6.1-7.3	0-5	0	0	0
3828:							
Crete----------	0-6	20-29	5.6-6.0	0	0	0	0
	6-11	22-29	5.6-6.0	0	0	0	0
	11-27	29-44	6.1-7.3	0	0	0	0
	27-40	25-36	6.1-7.3	0-5	0	0	0
	40-60	20-33	6.1-7.3	0-5	0	0	0
3830:							
Crete----------	0-6	20-29	5.6-6.0	0	0	0	0
	6-16	29-44	6.1-7.3	0	0	0	0
	16-29	25-36	6.1-7.3	0-5	0	0	0
	29-46	20-33	6.1-7.3	0-5	0	0	0
	46-60	20-33	6.1-7.3	0-5	0	0	0
3844:							
Geary----------	0-8	12-19	5.6-6.5	0	0	0	0
	8-18	15-22	5.6-6.5	0	0	0	0
	18-25	19-26	5.6-8.4	0	0	0	0
	25-48	19-26	5.6-8.4	0	0	0	0
	48-60	15-24	5.6-8.4	0	0	0	0
3845:							
Geary----------	0-6	12-19	5.6-6.5	0	0	0	0
	6-10	15-22	5.6-6.5	0	0	0	0
	10-16	19-26	5.6-8.4	0	0	0	0
	16-38	19-26	5.6-8.4	0	0	0	0
	38-60	15-24	5.6-8.4	0	0	0	0
3880:							
Holder----------	0-8	12-19	5.1-7.3	0	0	0	0
	8-14	12-21	5.1-7.3	0	0	0	0
	14-45	20-24	6.1-7.8	0	0	0	0
	45-58	12-21	6.6-8.4	0-2	0	0	0
	58-60	12-21	6.6-8.4	0-5	0	0	0
3882:							
Holder----------	0-8	12-19	5.1-7.3	0	0	0	0
	8-14	12-21	5.1-7.3	0	0	0	0
	14-45	20-24	6.1-7.8	0	0	0	0
	45-58	12-21	6.6-8.4	0-2	0	0	0
	58-60	12-21	6.6-8.4	0-5	0	0	0
3890:							
Ladysmith-------	0-7	23-29	5.6-7.3	0	0	0.0-2.0	0
	7-15	33-48	5.6-7.3	0	0	0.0-2.0	0
	15-30	33-48	5.6-7.8	0-2	0	0.0-2.0	0
	30-38	33-48	5.6-7.8	0-2	0	0.0-2.0	0
	38-60	29-44	7.4-8.4	0-2	0	0.0-2.0	0
3934:							
Valentine-------	0-5	2.0-10	5.6-7.3	0	0	0	0
	5-50	2.0-10	5.6-7.3	0	0	0	0
	50-60	0.0-6.0	5.6-7.3	0	0	0	0

Table 19.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	meq/100g	pH	Pct	Pct	mmhos/cm	
3936:							
Wells	0-12	12-19	5.6-6.5	0	0	0	0
	12-19	19-24	5.6-7.3	0	0	0	0
	19-37	19-24	5.6-7.3	0	0	0	0
	37-51	19-24	5.6-7.3	0	0	0	0
	51-63	10-21	5.6-7.3	0	0	0	0
Ortello	0-6	5.0-12	5.6-7.3	0	0	0	0
	6-15	5.0-12	5.6-7.3	0	0	0	0
	15-34	5.0-12	6.1-7.3	0	0	0	0
	34-60	5.0-12	6.1-7.3	0	0	0	0
3938:							
Wells	0-12	12-19	5.6-6.5	0	0	0	0
	12-19	19-24	5.6-7.3	0	0	0	0
	19-37	19-24	5.6-7.3	0	0	0	0
	37-51	19-24	5.6-7.3	0	0	0	0
	51-63	10-21	5.6-7.3	0	0	0	0
Ortello	0-6	5.0-12	5.6-7.3	0	0	0	0
	6-15	5.0-12	5.6-7.3	0	0	0	0
	15-34	5.0-12	6.1-7.3	0	0	0	0
	34-60	5.0-12	6.1-7.3	0	0	0	0
4150:							
Kahola	0-24	14-19	6.1-7.8	0	0	0	0
	24-36	14-19	6.1-7.8	0-3	0	0	0
	36-44	14-24	7.4-8.4	1-5	0	0	0
	44-60	14-24	7.4-8.4	1-5	0	0	0
4151:							
Kahola	0-24	14-19	6.1-7.8	0	0	0	0
	24-36	14-19	6.1-7.8	0-3	0	0	0
	36-44	14-24	7.4-8.4	1-5	0	0	0
	44-60	14-24	7.4-8.4	1-5	0	0	0
4530:							
Benfield	0-5	19-24	6.1-7.8	0	0	0	0
	5-10	24-30	6.6-8.4	0	0	0	0
	10-19	28-33	7.4-8.4	0	0	0	0
	19-34	28-36	7.4-8.4	0	0	0	0
	34-38	27-38	7.9-8.4	1-5	0	0	0
	38-56	---	---	---	---	---	---
Florence	0-5	20-28	5.6-7.3	0	0	0	0
	5-14	28-43	5.6-7.3	0	0	0	0
	14-48	43-62	6.1-7.8	0	0	0	0
	48-56	43-62	6.1-7.8	0-5	0	0	0
	56-60	---	---	---	---	---	---
4550:							
Clime	0-2	22-27	6.6-8.4	1-15	0	0	0
	2-9	22-33	6.6-8.4	5-15	0	0	0
	9-27	24-33	7.4-8.4	10-35	0	0	0
	27-33	24-33	7.4-8.4	10-35	0	0	0
	33-37	---	---	---	---	---	---
4590:							
Clime	0-12	22-27	6.6-8.4	1-15	0	0	0
	12-26	24-33	7.4-8.4	5-35	0	0	0
	26-30	24-33	7.4-8.4	10-35	0	0	0
	30-34	---	---	---	---	---	---

Table 19.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	meq/100g	pH	Pct	Pct	mmhos/cm	
4590:							
Sogn	0-9	19-24	6.1-8.4	0-5	0	0	0
	9-13	---	---	---	---	---	---
4673:							
Irwin	0-6	20-24	5.6-7.3	0	0	0.0-2.0	0-2
	6-13	20-24	5.6-7.3	0	0	0.0-2.0	0-2
	13-30	27-38	5.6-8.4	0-3	0	2.0-4.0	2-8
	30-41	27-38	5.6-8.4	0-3	0	2.0-4.0	2-8
	41-72	28-36	6.6-8.4	0-3	0	2.0-4.0	2-8
4735:							
Konza	0-6	20-29	5.6-7.3	0	0	0.0-2.0	0-2
	6-28	36-44	6.1-7.3	0	0	0.0-2.0	0-4
	28-42	29-36	7.4-8.4	0-2	0	0.0-2.0	0-6
	42-50	25-33	7.9-8.4	0-2	0-2	0.0-2.0	2-6
	50-70	29-36	7.4-8.4	0-5	0-2	0.0-2.0	4-10
	70-89	36-52	7.4-8.4	0-5	0-2	2.0-4.0	8-15
4781:							
Tully	0-12	20-26	5.6-7.3	0	0	0	0
	12-21	19-27	5.6-7.3	0	0	0	0
	21-31	27-36	5.6-8.4	0-5	0	0	0
	31-40	27-36	5.6-8.4	0-5	0	0	0
	40-52	27-36	5.6-8.4	0-5	0	0	0
	52-60	22-30	6.6-8.4	0-5	0	0	0
4783:							
Tully	0-12	20-26	5.6-7.3	0	0	0	0
	12-21	19-27	5.6-7.3	0	0	0	0
	21-31	27-36	5.6-8.4	0-5	0	0	0
	31-40	27-36	5.6-8.4	0-5	0	0	0
	40-52	27-36	5.6-8.4	0-5	0	0	0
	52-60	22-30	6.6-8.4	0-5	0	0	0
7031:							
Eudora	0-7	8.9-15	5.1-7.8	0	0	0	0
	7-14	8.9-15	5.1-7.8	0	0	0	0
	14-19	9.0-14	5.1-7.8	0	0	0	0
	19-26	2.0-14	5.1-8.5	0-5	0	0	0
	26-60	2.0-14	5.1-8.5	0-5	0	0	0
7081:							
Sarpy	0-9	2.0-5.0	6.6-8.4	0-2	0	0	0
	9-60	2.0-5.0	6.6-8.4	0-2	0	0	0
7082:							
Sarpy	0-4	2.0-5.0	6.6-8.4	0	0	0	0
	4-10	2.0-5.0	7.4-8.4	0	0	0	0
	10-60	2.0-5.0	7.4-8.4	0	0	0	0
7170:							
Reading	0-8	12-20	5.6-6.5	0	0	0	0
	8-20	19-21	5.6-6.5	0	0	0	0
	20-52	10-24	5.6-6.5	0	0	0	0
	52-60	15-27	6.1-7.8	0	0	0	0
7173:							
Reading	0-8	15-21	5.6-6.5	0	0	0	0
	8-20	15-21	5.6-6.5	0	0	0	0
	20-52	19-24	5.6-6.5	0	0	0	0
	52-60	19-27	6.1-7.8	0	0	0	0

Table 19.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	meq/100g	pH	Pct	Pct	mmhos/cm	
7740:							
Haynie----------	0-10	12-18	6.6-8.4	0-25	0	0	0
	10-60	8.9-14	7.4-8.4	5-30	0	0	0
9971. Arents, earthen dam							
9983. Gravel pits and quarries							
9986. Miscellaneous water							
9988. Orthents							
9999. Water							

Table 20.--Soil Features

(See text for definitions of terms used in this table. Absence of an entry indicates that the feature is not a concern or that data were not estimated.)

Map symbol and soil name	Restrictive layer			Potential frost action	Risk of corrosion	
	Depth to top	Kind	Thickness		Uncoated steel	Concrete
	In					
2177:						
McCook	---	---	---	Moderate	Low	Low
2181:						
McCook	---	---	---	Moderate	Low	Low
Smokyhill	---	---	---	Low	High	Low
2347:						
McCook	---	---	---	Moderate	Low	Low
3400:						
Longford	---	---	---	Moderate	High	Low
3545:						
Hobbs	---	---	---	Moderate	Low	Low
3561:						
Hobbs	---	---	---	Moderate	Low	Low
3617:						
Solomon	---	---	---	Moderate	High	Low
3633:						
Sutphen	---	---	---	Low	High	Low
3775:						
Muir	---	---	---	Moderate	Low	Moderate
3827:						
Crete	---	---	---	Low	Moderate	Low
3828:						
Crete	---	---	---	Low	Moderate	Low
3830:						
Crete	---	---	---	Low	Moderate	Low
3844:						
Geary	---	---	---	Moderate	Low	Low
3845:						
Geary	---	---	---	Moderate	Low	Low
3880:						
Holder	---	---	---	Moderate	Low	Low
3882:						
Holder	---	---	---	Moderate	Low	Low
3890:						
Ladysmith	---	---	---	Moderate	High	Low
3934:						
Valentine	---	---	---	Low	Low	Low

Table 20.--Soil Features--Continued

Map symbol and soil name	Restrictive layer			Potential frost action	Risk of corrosion	
	Depth to top	Kind	Thickness		Uncoated steel	Concrete
	In					
3936:						
Wells	---	---	---	Moderate	Low	Moderate
Ortello	---	---	---	Moderate	Moderate	Low
3938:						
Wells	---	---	---	Moderate	Low	Moderate
Ortello	---	---	---	Moderate	Moderate	Low
4150:						
Kahola	---	---	---	Moderate	Low	Low
4151:						
Kahola	---	---	---	Moderate	Low	Low
4530:						
Benfield	20-40	Bedrock (paralithic)	Moderately cemented	Low	High	Low
Florence	40-60	Bedrock (lithic)	Indurated	Low	Moderate	Low
4550:						
Clime	20-40	Bedrock (paralithic)	Moderately cemented	Low	High	Low
4590:						
Clime	20-40	Bedrock (paralithic)	Moderately cemented	Low	High	Low
Sogn	4-20	Bedrock (lithic)	Strongly cemented	Moderate	Low	Low
4673:						
Irwin	---	---	---	Moderate	High	Low
4735:						
Konza	---	---	---	Moderate	High	Moderate
4781:						
Tully	---	---	---	Low	High	Low
4783:						
Tully	---	---	---	Low	High	Low
7031:						
Eudora	---	---	---	High	Low	Low
7081:						
Sarpy	---	---	---	Low	Low	Low
7082:						
Sarpy	---	---	---	Low	Low	Low
7170:						
Reading	---	---	---	Moderate	Moderate	Low
7173:						
Reading	---	---	---	Moderate	Moderate	Low
7740:						
Haynie	---	---	---	High	Low	Low

Table 20.--Soil Features--Continued

Map symbol and soil name	Restrictive layer			Potential frost action	Risk of corrosion	
	Depth to top	Kind	Thickness		Uncoated steel	Concrete
	In					
9971. Arents, earthen dam						
9983. Gravel pits and quarries						
9986. Miscellaneous water						
9988. Orthents						
9999. Water						

Table 21.--Water Features

(See text for definitions of terms used in this table. Absence of an entry indicates that the feature is not a concern or that data were not estimated.)

Map symbol and soil name	Hydrologic group	Month	Ponding			Flooding	
			Surface water depth	Duration	Frequency	Duration	Frequency
			Ft				
2177:							
McCook	B						
		April	---	---	None	Very brief	Occasional
		May	---	---	None	Very brief	Occasional
		June	---	---	None	Very brief	Occasional
		July	---	---	None	Very brief	Occasional
		August	---	---	None	Very brief	Occasional
		September	---	---	None	Very brief	Occasional
		October	---	---	None	Very brief	Occasional
2181:							
McCook	B						
		April	---	---	None	Very brief	Occasional
		May	---	---	None	Very brief	Occasional
		June	---	---	None	Very brief	Occasional
		July	---	---	None	Very brief	Occasional
		August	---	---	None	Very brief	Occasional
		September	---	---	None	Very brief	Occasional
		October	---	---	None	Very brief	Occasional
Smokyhill	C						
		April	0.5-1.6	Brief	Rare	Brief	Occasional
		May	0.5-1.6	Brief	Rare	Brief	Occasional
		June	0.5-1.6	Brief	Rare	Brief	Occasional
		July	0.5-1.6	Brief	Rare	Brief	Occasional
		August	---	---	None	Brief	Occasional
		September	---	---	None	Brief	Occasional
		October	---	---	None	Brief	Occasional
2347:							
McCook	B						
		April	---	---	None	Very brief	Rare
		May	---	---	None	Very brief	Rare
		June	---	---	None	Very brief	Rare
		July	---	---	None	Very brief	Rare
		August	---	---	None	Very brief	Rare
		September	---	---	None	Very brief	Rare
		October	---	---	None	Very brief	Rare
3400:							
Longford	C	---	---	---	---	---	---
3545:							
Hobbs	B						
		April	---	---	None	Brief	Frequent
		May	---	---	None	Brief	Frequent
		June	---	---	None	Brief	Frequent
		July	---	---	None	Brief	Frequent
		August	---	---	None	Brief	Frequent
		September	---	---	None	Brief	Frequent
		October	---	---	None	Brief	Frequent

Table 21.--Water Features--Continued

Map symbol and soil name	Hydrologic group	Month	Ponding			Flooding	
			Surface water depth	Duration	Frequency	Duration	Frequency
			Ft				
3561:							
Hobbs	B						
		April	---	---	None	Brief	Occasional
		May	---	---	None	Brief	Occasional
		June	---	---	None	Brief	Occasional
		July	---	---	None	Brief	Occasional
		August	---	---	None	Brief	Occasional
		September	---	---	None	Brief	Occasional
		October	---	---	None	Brief	Occasional
3617:							
Solomon	D						
		March	0.5-1.6	Long	Frequent	---	---
		April	0.5-1.6	Long	Frequent	Brief	Occasional
		May	0.5-1.6	Long	Frequent	Brief	Occasional
		June	0.5-1.6	Long	Frequent	Brief	Occasional
		July	0.5-1.6	Long	Frequent	Brief	Occasional
		August	0.5-1.6	---	---	Brief	Occasional
		September	0.5-1.6	---	---	Brief	Occasional
		October	---	---	---	Brief	Occasional
3633:							
Sutphen	D						
		March	0.0-1.0	Brief	Occasional	---	None
		April	0.0-1.0	Brief	Occasional	Very brief	Occasional
		May	0.0-1.0	Brief	Occasional	Very brief	Occasional
		June	0.0-1.0	Brief	Occasional	Very brief	Occasional
		July	0.0-1.0	Brief	Occasional	Very brief	Occasional
		August	0.0-1.0	Brief	Occasional	Very brief	Occasional
		September	0.0-1.0	Brief	Occasional	Very brief	Occasional
		October	---	---	---	Very brief	Occasional
3775:							
Muir	B						
		April	---	---	None	Brief	Rare
		May	---	---	None	Brief	Rare
		June	---	---	None	Brief	Rare
		July	---	---	None	Brief	Rare
		August	---	---	None	Brief	Rare
		September	---	---	None	Brief	Rare
		October	---	---	None	Brief	Rare
3827:							
Crete	C	---	---	---	---	---	---
3828:							
Crete	C	---	---	---	---	---	---
3830:							
Crete	C	---	---	---	---	---	---
3844:							
Geary	B	---	---	---	---	---	---
3845:							
Geary	B	---	---	---	---	---	---
3880:							
Holder	B	---	---	---	---	---	---
3882:							
Holder	B	---	---	---	---	---	---

Table 21.--Water Features--Continued

Map symbol and soil name	Hydrologic group	Month	Ponding			Flooding	
			Surface water depth	Duration	Frequency	Duration	Frequency
			Ft				
3890:							
Ladysmith	D	---	---	---	---	---	---
3934:							
Valentine	A	---	---	---	---	---	---
3936:							
Wells	B	---	---	---	---	---	---
Ortello	B	---	---	---	---	---	---
3938:							
Wells	B	---	---	---	---	---	---
Ortello	B	---	---	---	---	---	---
4150:							
Kahola	B						
		January	---	---	None	---	---
		February	---	---	None	---	---
		March	---	---	None	---	---
		April	---	---	None	Very brief	Frequent
		May	---	---	None	Very brief	Frequent
		June	---	---	None	Very brief	Frequent
		July	---	---	None	Very brief	Frequent
		August	---	---	None	Very brief	Frequent
		September	---	---	None	Very brief	Frequent
		October	---	---	None	Very brief	Frequent
		November	---	---	None	---	---
		December	---	---	None	---	---
4151:							
Kahola	B						
		January	---	---	None	---	---
		February	---	---	None	---	---
		March	---	---	None	---	---
		April	---	---	None	Very brief	Occasional
		May	---	---	None	Very brief	Occasional
		June	---	---	None	Very brief	Occasional
		July	---	---	None	Very brief	Occasional
		August	---	---	None	Very brief	Occasional
		September	---	---	None	Very brief	Occasional
		October	---	---	None	Very brief	Occasional
		November	---	---	None	---	---
		December	---	---	None	---	---
4530:							
Benfield	C	---	---	---	---	---	---
Florence	C	---	---	---	---	---	---
4550:							
Clime	C	---	---	---	---	---	---
4595:							
Clime	C	---	---	---	---	---	---
Sogn	D	---	---	---	---	---	---
4673:							
Irwin	D	---	---	---	---	---	---

Table 21.--Water Features--Continued

Map symbol and soil name	Hydrologic group	Month	Ponding			Flooding	
			Surface water depth	Duration	Frequency	Duration	Frequency
			Ft				
4735:							
Konza	D	---	---	---	---	---	---
4781:							
Tully	C	---	---	---	---	---	---
4783:							
Tully	C	---	---	---	---	---	---
7031:							
Eudora	B						
		April	---	---	None	Very brief	Occasional
		May	---	---	None	Very brief	Occasional
		June	---	---	None	Very brief	Occasional
		July	---	---	None	Very brief	Occasional
		August	---	---	None	Very brief	Occasional
		September	---	---	None	Very brief	Occasional
		October	---	---	None	Very brief	Occasional
7081:							
Sarpy	A						
		April	---	---	None	Brief	Occasional
		May	---	---	None	Brief	Occasional
		June	---	---	None	Brief	Occasional
		July	---	---	None	Brief	Occasional
		August	---	---	None	Brief	Occasional
		September	---	---	None	Brief	Occasional
		October	---	---	None	Brief	Occasional
7082:							
Sarpy	A						
		April	---	---	None	Brief	Occasional
		May	---	---	None	Brief	Occasional
		June	---	---	None	Brief	Occasional
		July	---	---	None	Brief	Occasional
		August	---	---	None	Brief	Occasional
		September	---	---	None	Brief	Occasional
		October	---	---	None	Brief	Occasional
7170:							
Reading	B						
		March	---	---	None	---	Rare
		April	---	---	None	---	Rare
		May	---	---	None	---	Rare
		June	---	---	None	---	Rare
		July	---	---	None	---	Rare
		August	---	---	None	---	Rare
		September	---	---	None	---	Rare
		October	---	---	None	---	Rare
		November	---	---	None	---	Rare
7173:							
Reading	B						
		March	---	---	None	---	Rare
		April	---	---	None	---	Rare
		May	---	---	None	---	Rare
		June	---	---	None	---	Rare
		July	---	---	None	---	Rare
		August	---	---	None	---	Rare
		September	---	---	None	---	Rare
		October	---	---	None	---	Rare
		November	---	---	None	---	Rare

Table 21.--Water Features--Continued

Map symbol and soil name	Hydrologic group	Month	Ponding			Flooding	
			Surface water depth	Duration	Frequency	Duration	Frequency
			Ft				
7740:							
Haynie	B						
		April	---	---	None	Very brief	Frequent
		May	---	---	None	Very brief	Frequent
		June	---	---	None	Very brief	Frequent
		July	---	---	None	Very brief	Frequent
		August	---	---	None	Very brief	Frequent
		September	---	---	None	Very brief	Frequent
		October	---	---	None	Very brief	Frequent
9971.							
Arents, earthen dam							
9983.							
Gravel pits and quarries							
9986.							
Miscellaneous water							
9988.							
Orthents							
9999.							
Water							

Table 22.--Classification of the Soils

Soil name	Family or higher taxonomic class
Benfield	Fine, mixed, superactive, mesic Udertic Argiustolls
Clime	Fine, mixed, active, mesic Udorthentic Haplustolls
Crete	Fine, smectitic, mesic Pachic Argiustolls
Eudora	Coarse-silty, mixed, superactive, mesic Fluventic Hapludolls
Florence	Clayey-skeletal, smectitic, mesic Udic Argiustolls
Geary	Fine-silty, mixed, superactive, mesic Udic Argiustolls
Haynie	Coarse-silty, mixed, superactive, calcareous, mesic Mollic Udifluvents
Hobbs	Fine-silty, mixed, superactive, nonacid, mesic Mollic Ustifluvents
Holder	Fine-silty, mixed, superactive, mesic Udic Argiustolls
Irwin	Fine, mixed, superactive, mesic Pachic Argiustolls
Kahola	Fine-silty, mixed, superactive, mesic Cumulic Hapludolls
Konza	Fine, smectitic, mesic Udertic Paleustolls
Labette	Fine, mixed, mesic Udic Argiustolls
Ladysmith	Fine, smectitic, mesic Udertic Argiustolls
Longford	Fine, smectitic, mesic Udic Argiustolls
McCook	Coarse-silty, mixed, superactive, mesic Fluventic Haplustolls
Muir	Fine-silty, mixed, superactive, mesic Cumulic Haplustolls
Ortello	Coarse-loamy, mixed, superactive, mesic Udic Haplustolls
Reading	Fine-silty, mixed, superactive, mesic Pachic Argiudolls
Sarpy	Mixed, mesic Typic Udipsamments
Smokyhill	Clayey over loamy, mixed, superactive, mesic Cumulic Haplustolls
Sogn	Loamy, mixed, superactive, mesic Lithic Haplustolls
Solomon	Fine, smectitic, calcareous, mesic Vertic Epiaquolls
Sutphen	Fine, smectitic, mesic Udertic Haplustolls
Tully	Fine, mixed, superactive, mesic Pachic Argiustolls
Valentine	Mixed, mesic Typic Ustipsamments
Wells	Fine-loamy, mixed, active, mesic Udic Argiustolls

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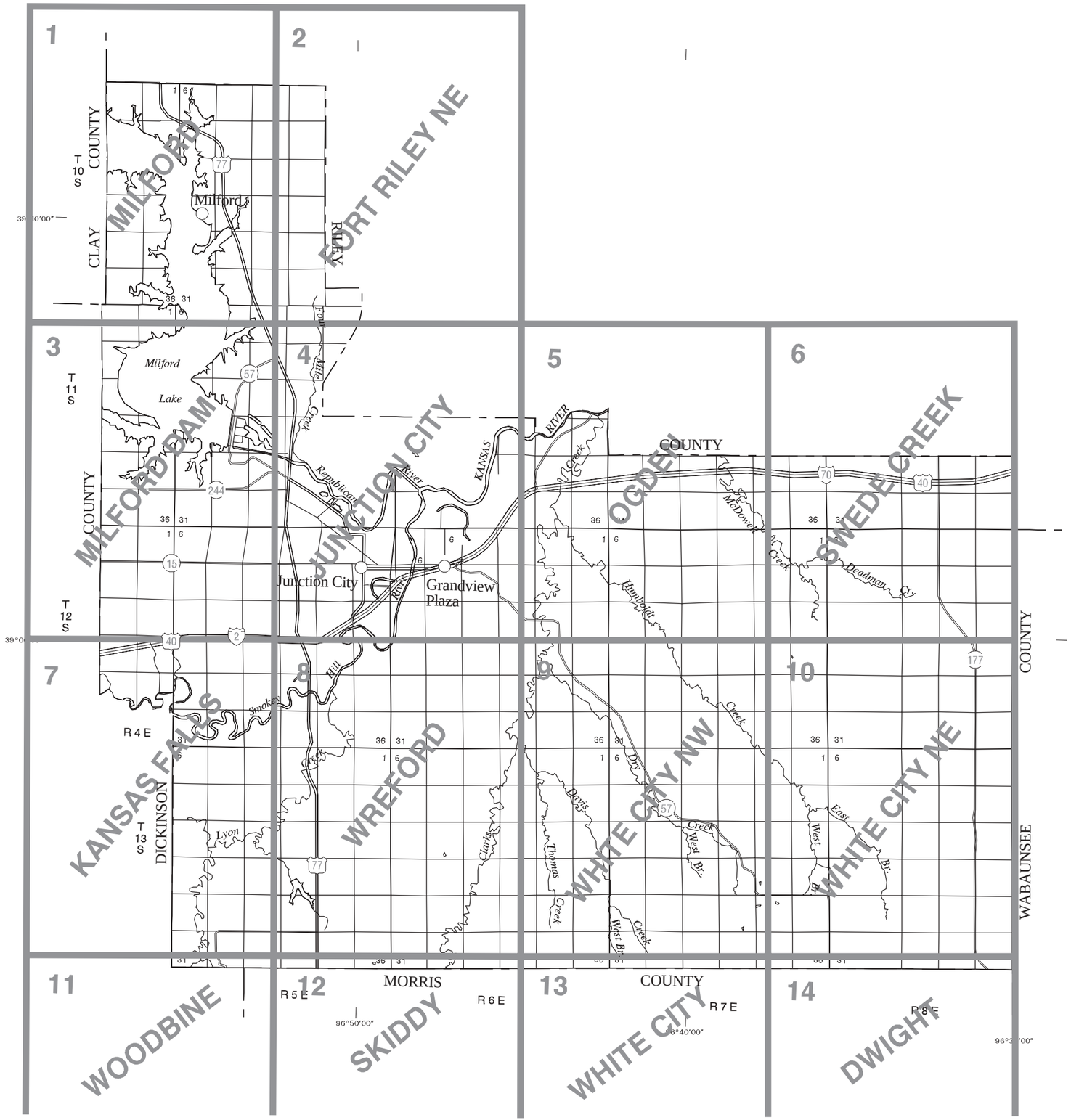

N

INDEX TO MAP SHEETS

GEARY COUNTY, KANSAS

Scale 1:190080

4 0 4
MILES
8 0 8
KILOMETERS

SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

SOIL LEGEND

SYMBOL	NAME
2177	McCook silt loam, occasionally flooded
2181	McCook-Smokyhill silt loams, occasionally flooded
2347	McCook silt loam, rarely flooded
3400	Longford loam, 1 to 3 percent slopes
3545	Hobbs silt loam, channeled
3561	Hobbs silt loam, occasionally flooded
3617	Solomon silty clay, occasionally flooded
3633	Sutphen silty clay, occasionally flooded
3775	Muir silt loam, rarely flooded
3827	Crete silty clay loam, 0 to 1 percent slopes
3828	Crete silty clay loam, 1 to 3 percent slopes
3830	Crete silty clay loam, 3 to 7 percent slopes
3844	Geary silt loam, 3 to 7 percent slopes
3845	Geary silt loam, 7 to 15 percent slopes
3880	Holder silt loam, 1 to 3 percent slopes
3882	Holder silt loam, 3 to 7 percent slopes
3890	Ladysmith silty clay loam, 0 to 1 percent slopes
3934	Valentine loamy fine sand, 5 to 15 percent slopes
3936	Wells-Ortello complex, 1 to 4 percent slopes
3938	Wells-Ortello complex, 4 to 8 percent slopes
4150	Kahola silt loam, channeled
4151	Kahola silt loam, occasionally flooded
4530	Benfield-Florence complex, 5 to 30 percent slopes
4550	Clime silty clay loam, 20 to 40 percent slopes, very stony
4590	Clime-Sogn complex, 3 to 20 percent slopes
4673	Irwin silty clay loam, 3 to 7 percent slopes
4735	Konza silty clay loam, 1 to 3 percent slopes
4781	Tully silty clay loam, 1 to 3 percent slopes
4783	Tully silty clay loam, 3 to 7 percent slopes
7031	Eudora silt loam, occasionally flooded
7081	Sarpy loamy fine sand, 0 to 4 percent slopes
7082	Sarpy gravelly loamy sand, occasionally flooded
7170	Reading silt loam, rarely flooded
7173	Reading silty clay loam, rarely flooded
7740	Haynie silt loam, frequently flooded
9971	Arents, earthen dam
9983	Gravel pits and quarries
9986	Miscellaneous water
9988	Orthents
9999	Water

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- National, state, or province
- County or parish
- Minor civil division
- Reservation (national forest or park, state forest or park)
- Land grant
- Limit of soil survey (lable) and/or denied access area
- Field sheet matchline & neatline
- Previously Published Survey

OTHER BOUNDARY (label)

- Airport, airfield
- Cemetery
- City/county park

STATE COORDINATE TICK
1 890 000 FEET

LAND DIVISION CORNER
(section and land grants)

GEOGRAPHIC COORDINATE TICK

TRANSPORTATION

- Divided roads
- Other roads
- Trail

ROAD EMBLEM & DESIGNATIONS

- Interstate (173, 79 345)
- Federal (287, 410 224)
- State (52, 52 347)
- County, farm or ranch (1283)

RAILROAD

POWER TRANSMISSION LINE
(normally not shown)

PIPE LINE (normally not shown)

FENCE (normally not shown)

LEVEES

- Without road
- With road
- With railroad
- Single side slope (showing actual feature location)

DAMS

- Medium or Small

LANDFORM FEATURES

- Prominent hill or peak
- Soil Sample Site

MISCELLANEOUS CULTURAL FEATURES

- Farmstead, house (omit in urban areas)
- Church
- School
- Other Religion (label) (Mt Carmel)
- Located object (label) (Ranger Station)
- Tank (label) (Petroleum)
- Lookout Tower
- Oil and/or Natural Gas Wells
- Windmill
- Lighthouse

HYDROGRAPHIC FEATURES

STREAMS

- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end

DRAINAGE AND IRRIGATION

- Double-line canal (label) (CANAL)
- Perennial drainage and/or irrigation ditch
- Intermittent drainage and/ or irrigation ditch

SMALL LAKES, PONDS AND RESERVOIRS

- Perennial water
- Miscellaneous water
- Flood pool line (FLOOD POOL LINE)

MISCELLANEOUS WATER FEATURES

- Spring
- Well, artesian
- Well, irrigation

SPECIAL SYMBOLS FOR SOIL SURVEY AND SSURGO

SOIL DELINEATIONS AND SYMBOLS (MnpC2 PcrB2)

LANDFORM FEATURES

ESCARPMENTS

- Bedrock
- Other than bedrock

SHORT STEEP SLOPE

GULLY

DEPRESSION, closed

SINKHOLE

EXCAVATIONS

PITS

- Borrow pits
- Gravel pit
- Mine or quarry

LANDFILL

MISCELLANEOUS SURFACE FEATURES

- Blowout
- Clay spot
- Gravelly spot
- Lava flow
- Marsh or swamp
- Rock outcrop (includes sandstone and shale)
- Saline spot
- Sandy spot
- Severely eroded spot
- Slide or slip
- Sodic spot
- Spoil area
- Stony spot
- Very stony spot
- Wet spot
- Wet Depressions
- Muck
- Unclassified Water

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

GEARY COUNTY, KANSAS
MILFORD QUADRANGLE
SHEET NUMBER 1 OF 14

97°00′00″ 96°57′30″ 96°55′00″ 96°52′30″

R. 4 E. R. 5 E.

39°15′00″ 39°12′30″ 39°10′00″ 39°07′30″

T. 9 S.
T. 10 S.
T. 10 S.
T. 11 S.

RILEY COUNTY
CLAY COUNTY
DICKINSON COUNTY

MILFORD LAKE

FORT RILEY
MILITARY
RESERVATION

Milford

Farnum Creek
Rush Creek

Joins sheet 2, Fort Riley NE
Joins sheet 3, Milford Dam
Joins sheet 4, Junction City

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North American Datum of 1983 (NAD83). GRS-80 Spheriod 1000-meter ticks: Universal Transverse Mercator, zone 14. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

NORTH

QUADRANGLE LOCATION

SCALE 1:24000

1 0 1
MILES

1000 0 1000 2000 3000 4000 5000 6000 7000
FEET

1 0 1
KILOMETERS

MILFORD, KANSAS
7.5 MINUTE SERIES
SHEET NUMBER 1 OF 14

Soil map delineations extending beyond the dashed white quadrangle neatline are for reference only and are included on adjacent map sheets.

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

GEARY COUNTY, KANSAS
FORT RILEY NE QUADRANGLE
SHEET NUMBER 2 OF 14

96°52′30″ 96°50′00″ 96°47′30″ 96°45′00″

R. 5 E. R. 6 E.

39°15′00″

T. 9 S.
T. 10 S.

39°12′30″

39°10′00″

39°07′30″

T. 10 S.
T. 11 S.

FORT RILEY MILITARY RESERVATION

RILEY COUNTY

Farmon Creek

Rush Creek

Joins sheet 1, Milford

Joins sheet 3, Milford Dam

Joins sheet 4, Junction City

Joins sheet 5, Ogden

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NORTH

QUADRANGLE LOCATION

SCALE 1:24000

1 0 1
MILES

1000 0 1000 2000 3000 4000 5000 6000 7000
FEET

1 0 1
KILOMETERS

FORT RILEY NE, KANSAS
7.5 MINUTE SERIES
SHEET NUMBER 2 OF 14

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UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

GEARY COUNTY, KANSAS
MILFORD DAM QUADRANGLE
SHEET NUMBER 3 OF 14

Joins sheet 2, Fort Riley NE

97° 00′ 00″ — 96° 57′ 30″ — 96° 55′ 00″ — 96° 52′ 30″

Joins sheet 1, Milford

R. 4 E. R. 5 E.

39° 07′ 30″ — 39° 05′ 00″ — 39° 02′ 30″ — 39° 00′ 00″

MILFORD LAKE

DICKINSON COUNTY

T. 11 S.
T. 12 S.

Joins sheet 4, Junction City

Joins sheet 7, Kansas Falls

Joins sheet 8, Wreford

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NORTH

QUADRANGLE LOCATION

SCALE 1:24000

1 0 1
MILES

1000 0 1000 2000 3000 4000 5000 6000 7000
FEET

1 0 1
KILOMETERS

MILFORD DAM, KANSAS
7.5 MINUTE SERIES
SHEET NUMBER 3 OF 14

Soil map delineations extending beyond the dashed white quadrangle neatline are for reference only and are included on adjacent map sheets.

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

GEARY COUNTY, KANSAS
JUNCTION CITY QUADRANGLE
SHEET NUMBER 4 OF 14

Joins sheet 1, Milford

96°52′30″ 96°50′00″ 96°47′30″ 96°45′00″

39°07′30″ 39°05′00″ 39°02′30″ 39°00′00″

R. 5 E. R. 6 E.

T. 11 S.
T. 12 S.

Joins sheet 2, Fort Riley NE
Joins sheet 3, Milford Dam
Joins sheet 5, Ogden
Joins sheet 7, Kansas Falls
Joins sheet 8, Wreford
Joins sheet 9, White City NW

RILEY COUNTY

FORT RILEY MILITARY RESERVATION

JUNCTION CITY

REPUBLICAN RIVER

SMOKY HILL RIVER

KANSAS RIVER

Creek

Braindview Plaza

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NORTH

QUADRANGLE LOCATION

SCALE 1:24000

1 0 1
MILES

1000 0 1000 2000 3000 4000 5000 6000 7000
FEET

1 0 1
KILOMETERS

JUNCTION CITY, KANSAS
7.5 MINUTE SERIES
SHEET NUMBER 4 OF 14

Soil map delineations extending beyond the dashed white quadrangle neatline are for reference only and are included on adjacent map sheets.

Joins sheet 2, Fort Riley NE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

GEARY COUNTY, KANSAS
OGDEN QUADRANGLE
SHEET NUMBER 5 OF 14

96° 45′ 00″ — 96° 42′ 30″ — 96° 40′ 00″ — 96° 37′ 30″

R. 6 E. — R. 7 E.

39° 07′ 30″ — 39° 05′ 00″ — 39° 02′ 30″ — 39° 00′ 00″

RILEY COUNTY

Joins sheet 4, Junction City

Joins sheet 6, Swede Creek

T. 11 S.
T. 12 S.

Joins sheet 8, Wreford

Joins sheet 9, White City NW

Joins sheet 10, White City NE

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NORTH

QUADRANGLE LOCATION

SCALE 1:24000

1 0 1
MILES

1000 0 1000 2000 3000 4000 5000 6000 7000
FEET

1 0 1
KILOMETERS

OGDEN, KANSAS
7.5 MINUTE SERIES
SHEET NUMBER 5 OF 14

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UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

GEARY COUNTY, KANSAS
SWEDE CREEK QUADRANGLE
SHEET NUMBER 6 OF 14

96° 37′ 30″ — 96° 35′ 00″ — 96° 32′ 30″ — 96° 30′ 00″

R. 7 E. R. 8 E.

39° 07′ 30″

39° 05′ 00″

39° 02′ 30″

39° 00′ 00″

RILEY COUNTY

RILEY COUNTY

WABAUNSEE COUNTY

T. 11 S.
T. 12 S.

Joins sheet 5, Ogden

Joins sheet 9, White City NW

Joins sheet 10, White City NE

Creek
Branch
Deadman Creek
McDowell Creek
West Fork McDowell Creek
Middle Branch
Horne Creek
Poole Branch

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NORTH

QUADRANGLE LOCATION

SCALE 1:24000

1 0 1
MILES

1000 0 1000 2000 3000 4000 5000 6000 7000
FEET

1 0 1
KILOMETERS

SWEDE CREEK, KANSAS
7.5 MINUTE SERIES
SHEET NUMBER 6 OF 14

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UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

GEARY COUNTY, KANSAS
KANSAS FALLS QUADRANGLE
SHEET NUMBER 7 OF 14

Joins sheet 4, Junction City

97°00′00″ 96°57′30″ 96°55′00″ 96°52′30″

Joins sheet 3, Milford Dam

R. 4 E. R. 5 E.

39°00′00″ 38°57′30″ 38°55′00″ 38°52′30″

T. 12 S.
T. 13 S.

DICKINSON COUNTY

Joins sheet 6, Wreford

Joins sheet 11, Woodbine

Joins sheet 12, Skiddy

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NORTH

QUADRANGLE LOCATION

SCALE 1:24000

1 0 1
MILES

1000 0 1000 2000 3000 4000 5000 6000 7000
FEET

1 0 1
KILOMETERS

KANSAS FALLS, KANSAS
7.5 MINUTE SERIES
SHEET NUMBER 7 OF 14

Soil map delineations extending beyond the dashed white quadrangle neatline are for reference only and are included on adjacent map sheets.

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

GEARY COUNTY, KANSAS
WREFORD QUADRANGLE
SHEET NUMBER 8 OF 14

Joins sheet 3, Milford Dam

Joins sheet 5, Ogden

Joins sheet 4, Junction City

96°52′30″ 96°50′00″ 96°47′30″ 96°45′00″

39°00′00″

R. 5 E. R. 6 E.

38°57′30″
T. 12 S.
T. 13 S.

38°55′00″

38°52′30″

Joins sheet 7, Kansas Falls

Joins sheet 9, White City NW

Joins sheet 11, Woodbine

Joins sheet 12, Skiddy

Joins sheet 13, White City

SMOKY HILL RIVER

Lyon Creek

Clarks Creek

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NORTH

QUADRANGLE LOCATION

SCALE 1:24000

1 0 1
MILES

1000 0 1000 2000 3000 4000 5000 6000 7000
FEET

1 0 1
KILOMETERS

WREFORD, KANSAS
7.5 MINUTE SERIES
SHEET NUMBER 8 OF 14

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UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

GEARY COUNTY, KANSAS
WHITE CITY NW QUADRANGLE
SHEET NUMBER 9 OF 14

Joins sheet 4, Junction City
Joins sheet 5, Ogden
Joins sheet 6, Swede Creek
Joins sheet 8, Wreford
Joins sheet 10, White City NE
Joins sheet 12, Skiddy
Joins sheet 13, White City
Joins sheet 14, Dwight

96° 45′ 00″ — 96° 42′ 30″ — 96° 40′ 00″ — 96° 37′ 30″
R. 6 E. R. 7 E.
39° 00′ 00″
38° 57′ 30″
T. 12 S.
T. 13 S.
38° 55′ 00″
38° 52′ 30″

Creek, Clarks, Dry, Creek, Huntbaldt, Creek, Davis, Creek, Thomas, Creek, West, Creek, Davis, West, Creek, Dry, Creek, West, Branch, Branch

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NORTH

QUADRANGLE LOCATION

SCALE 1:24000

1 0 1
MILES

1000 0 1000 2000 3000 4000 5000 6000 7000
FEET

1 0 1
KILOMETERS

WHITE CITY NW, KANSAS
7.5 MINUTE SERIES
SHEET NUMBER 9 OF 14

Soil map delineations extending beyond the dashed white quadrangle neatline are for reference only and are included on adjacent map sheets.

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

GEARY COUNTY, KANSAS
WHITE CITY NE QUADRANGLE
SHEET NUMBER 10 OF 14

Joins sheet 5, Ogden

96°37′30″ 96°35′00″ 96°32′30″ 96°30′00″

R. 7 E. R. 8 E.

39°00′00″

38°57′30″
T. 12 S.
T. 13 S.

38°55′00″

38°52′30″

Joins sheet 6, Swede Creek

Joins sheet 9, White City NW

Joins sheet 13, White City

Joins sheet 14, Dwight

WABAUNSEE COUNTY

Poole Branch
MacArthur Branch
Horne Branch
Thierer Branch
Humboldt Creek
East Branch
West Branch

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North American Datum of 1983 (NAD83). GRS-80 Spheriod 1000-meter ticks: Universal Transverse Mercator, zone 14. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

NORTH

QUADRANGLE LOCATION

SCALE 1:24000

1 0 1
MILES

1000 0 1000 2000 3000 4000 5000 6000 7000
FEET

1 0 1
KILOMETERS

WHITE CITY NE, KANSAS
7.5 MINUTE SERIES
SHEET NUMBER 10 OF 14

Soil map delineations extending beyond the dashed white quadrangle neatline are for reference only and are included on adjacent map sheets.

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

GEARY COUNTY, KANSAS
WOODBINE QUADRANGLE
SHEET NUMBER 11 OF 14

Joins sheet 7, Kansas Falls

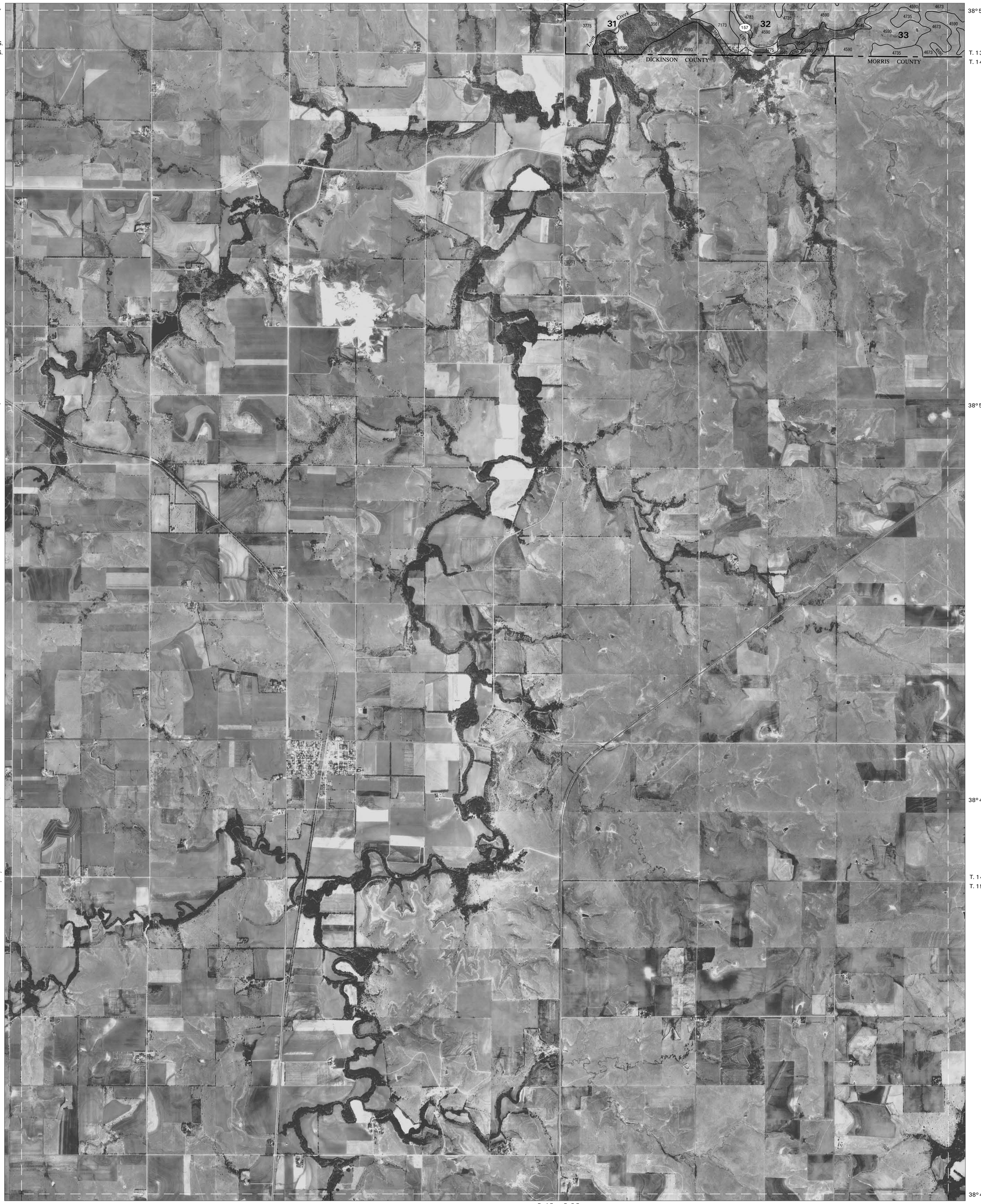
Joins sheet 8, Wreford

97°00′00″ 96°57′30″ 96°55′00″ 96°52′30″

38°52′30″ 38°50′00″ 38°47′30″ 38°45′00″

R. 4 E. R. 5 E.

T. 13 S.
T. 14 S.
T. 15 S.



Joins sheet 12, Skiddy

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North American Datum of 1983 (NAD83). GRS-80 Spheriod 1000-meter ticks: Universal Transverse Mercator, zone 14. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

NORTH

QUADRANGLE LOCATION

SCALE 1:24000

1 0 1
MILES

1000 0 1000 2000 3000 4000 5000 6000 7000
FEET

1 0 1
KILOMETERS

WOODBINE, KANSAS
7.5 MINUTE SERIES
SHEET NUMBER 11 OF 14

Soil map delineations extending beyond the dashed white quadrangle neatline are for reference only and are included on adjacent map sheets.

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

GEARY COUNTY, KANSAS
SKIDDY QUADRANGLE
SHEET NUMBER 12 OF 14

Joins sheet 7, Kansas Falls

Joins sheet 9, White City NW

Joins sheet 8, Wreford

Joins sheet 11, Woodbine

Joins sheet 13, White City

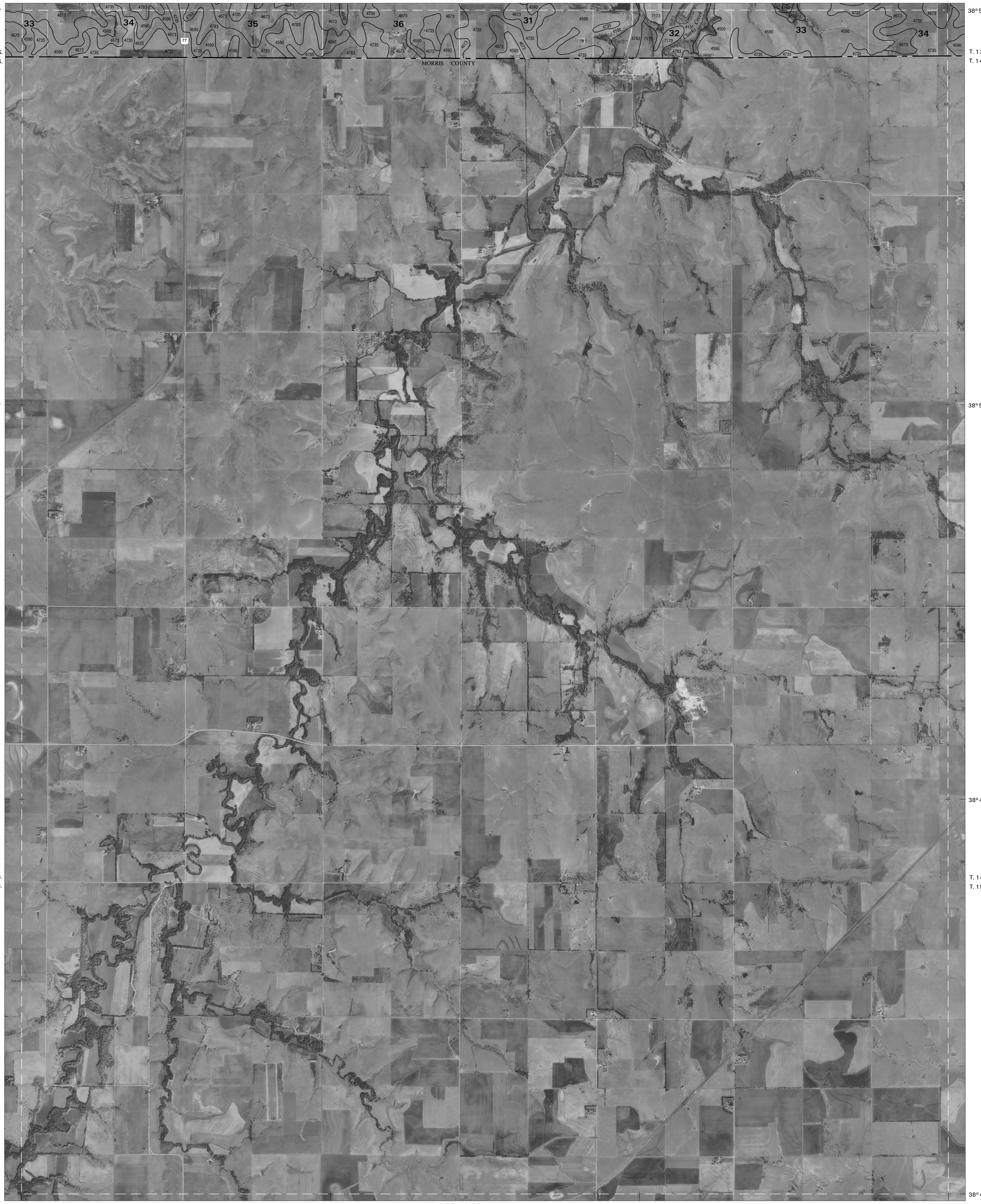
96°52′30″ 96°50′00″ 96°47′30″ 96°45′00″

38°52′30″ 38°50′00″ 38°47′30″ 38°45′00″

R. 5 E. R. 6 E.

T. 13 S.
T. 14 S.
T. 14 S.
T. 15 S.

MORRIS COUNTY



This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1991 and 1998 aerial photography. Public land survey system (PLSS) were acquired from U.S. Geological Survey.

North American Datum of 1983 (NAD83). GRS-80 Spheriod 1000-meter ticks: Universal Transverse Mercator, zone 14. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

NORTH

QUADRANGLE LOCATION

SCALE 1:24000

1 0 1
MILES

1000 0 1000 2000 3000 4000 5000 6000 7000
FEET

1 0 1
KILOMETERS

SKIDDY, KANSAS
7.5 MINUTE SERIES
SHEET NUMBER 12 OF 14

Soil map delineations extending beyond the dashed white quadrangle neatline are for reference only and are included on adjacent map sheets.

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

GEARY COUNTY, KANSAS
WHITE CITY QUADRANGLE
SHEET NUMBER 13 OF 14

Joins sheet 8, Wreford

Joins sheet 10, White City NE

Joins sheet 9, White City NW

96° 45′ 00″ | 96° 42′ 30″ | 96° 40′ 00″ | 96° 37′ 30″

R. 6 E. R. 7 E.

38° 52′ 30″

T. 13 S.
T. 14 S.

MORRIS COUNTY

38° 50′ 00″

Joins sheet 12, Skiddy

Joins sheet 14, Dwight

38° 47′ 30″

T. 14 S.
T. 15 S.

38° 45′ 00″

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North American Datum of 1983 (NAD83). GRS-80 Spheriod 1000-meter ticks: Universal Transverse Mercator, zone 14. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

NORTH

QUADRANGLE LOCATION

SCALE 1:24000

1 0 1
MILES

1000 0 1000 2000 3000 4000 5000 6000 7000
FEET

1 0 1
KILOMETERS

WHITE CITY, KANSAS
7.5 MINUTE SERIES
SHEET NUMBER 13 OF 14

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UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

GEARY COUNTY, KANSAS
DWIGHT QUADRANGLE
SHEET NUMBER 14 OF 14

Joins sheet 9, White City NW

Joins sheet 10, White City NE

96°37′30″ 96°35′00″ 96°32′30″ 96°30′00″

R. 7 E. R. 8 E.

38°52′30″ T. 13 S. T. 14 S.

MORRIS COUNTY

WABAUNSEE COUNTY

38°50′00″

38°47′30″ T. 14 S. T. 15 S.

38°45′00″

Joins sheet 13, White City

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North American Datum of 1983 (NAD83). GRS-80 Spheriod 1000-meter ticks: Universal Transverse Mercator, zone 14. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

NORTH

QUADRANGLE LOCATION

SCALE 1:24000

1 0 1
MILES

1000 0 1000 2000 3000 4000 5000 6000 7000
FEET

1 0 1
KILOMETERS

DWIGHT, KANSAS
7.5 MINUTE SERIES
SHEET NUMBER 14 OF 14

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